American Machinist

Volume 66 New York, January 6, 1927 Number 1

How Far Have We Come and Where Are We Going?

By K. H. Condit
Editor, American Machinist

IN New England are some of the most beautiful mountains in the world—to look at, and to climb. The Presidential Range, with the Northern peaks leading up to Mt. Washington and the Southern peaks leading down again, presents a profile not unlike the economist's business curve—as it has been in the past, and may continue to be.

By contrast there is Maine's famous Mt. Katahdin, a great stone that bulks hugely from surrounding plains. The ascent to the summit of Katahdin is steep but when one reaches it he finds a great plateau miles long and roughly level.

Signs are beginning to multiply that the course of business, in the United States at least, has reached a Katahdin-like plateau, far above the plains of the past, and that the high peaks and abrupt descents of the Presidential Range will no longer be paralleled by the booms and depressions of economic history.

It would be foolish to state positively that we shall never have another business depression because there can be no assurance that business men will never again grow overconfident and speculate. On the other hand, some of the causes of depression no longer exist. Credit inelasticity is a thing of the past, thanks to our modern banking system. The much greater efficiency of our transportation systems has made speculation in raw material a useless gamble, and hand-to-mouth buying an almost universal practice. Education in business principles, cost systems that give current costs instead of ancient history, information from trade associations, Government agencies and the business press, the budgeting of sales and production, greater confidence in the integrity of business men in general, all these factors will do much to forestall another depression, or at least to soften its effect.

THERE is much talk about the adverse effect of anti-American sentiment in Europe on American export business with European countries, and of great trusts and cartels that have been formed to drive American firms from the field. The anti-American feeling exists but it has had little effect in numbing the pocketbook nerve of the European buyer. So long as American goods of better quality can be set down in Europe for less money they will be bought. And why worry about competition from European countries? It has been inevitable and only postponed until they

recovered sufficiently from the devastation of war to go after business. Europe has long been America's best market and will be a better one as she gains in buying power.

South America is growing steadily as a market for all kinds of manufactured goods. The Far East is not so promising as the Chinese indulge in the civil war that has followed the fall of every dynasty for the last 3,000 years. Australia and New Zealand absorb many American machines and some day, perhaps not so far in the future, Africa will be opened up and her treasures made available to the rest of the world.

But, after all, the greatest of all markets lies in the United States. Prosperity and high wages have resulted in a buying power and a standard of living beyond anything the world has seen. Back of the machines that are an indispensable part of this mode of life lie the many different types of production equipment which find their greatest markets with the builders of machinery, of automobiles, of electrical equipment, machinery and devices, of iron and steel products, and of transportation equipment.

In the machinery field no great expansion of capacity is needed, nor is it to be expected. There is a crying need for the replacement of obsolete equipment, however. Something like fifty per cent of the metal working equipment is more than ten years old.

LIKEWISE, the automotive industry has seen its greatest increase, so far as wheeled vehicles are concerned, and should be figured largely as a replacement market although not so exclusively so as in the case of the machinery manufacturers because of possibilities in the development of air transportation. 1926 has been a wonderful year for the automobile and parts manufacturers, with a few notable exceptions. 1927 will probably witness a competition for business that will beat all records. If this competition forces new and improved models, as it is likely to, orders for new production units should result.

The electrical manufacturing industry is in a different class from the two just mentioned. It is still growing and no one can tell when some new discovery or application of electric power will open up a whole new field. The public utility companies are constantly being forced to enlarge their plants to meet the demands upon them and thus provide a rather steady market for power generating units. Electrically driven household machines have attained great popularity but there is a much wider usefulness ahead of them.

AS TO the iron and steel products market for metal working equipment, there is nothing to indicate that it will change for the worse in 1927. Certainly the action of the directors of the United States Steel Corporation, led by Gary, Morgan and Baker, in declaring a 40 per cent stock dividend shows a real faith in the future. The transportation equipment field and the other markets of lesser importance show no signs of distress now and there is no apparent reason why they should later.

The year 1926 has brought unequaled prosperity to the United States. Can we expect as much, or more, from 1927? Or should we consider that we have struggled up the lesser northern peaks of 1923, 1924 and 1925 and now stand on the Mt. Washington pinnacle of 1926 looking southward to years of decreasing business?

Or, in view of the underlying soundness of general business, can we not believe that we have attained the Katahdin plateau of sustained prosperity and will remain there unless we get dizzy and fall over the edge? The high plateau is not dead level, of course. It has its ups and downs but they are relatively insignificant. Let us keep our heads and stay on it taking the little recessions, when they come, as warnings to keep away from the edge.

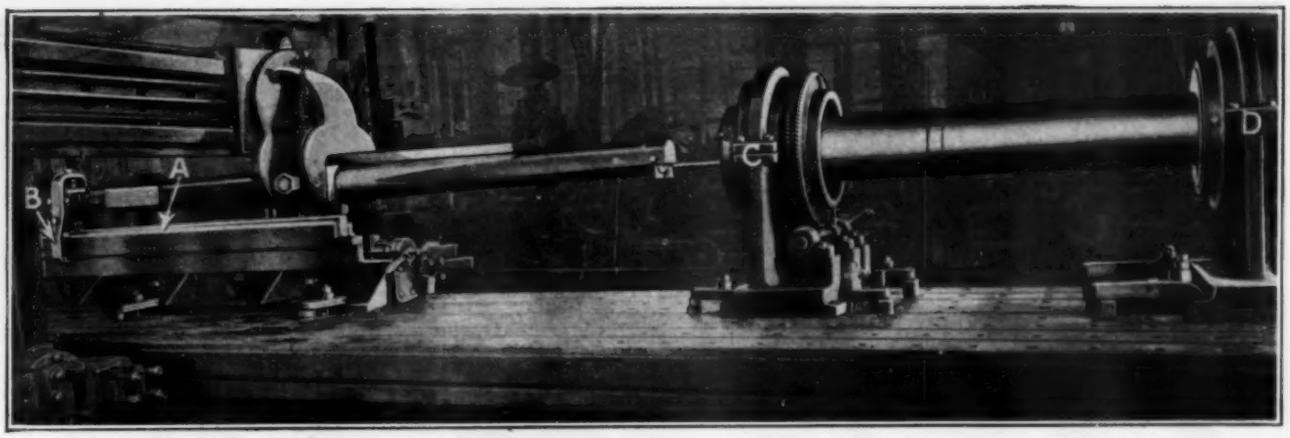


Fig. 1—Planing throttling grooves in large recoil cylinders

Planing Devices for Grooving Recoil Cylinders

FRED H. COLVIN
Editor, American Machinist

How the throttling grooves in recoil cylinders for gun carriages of various kinds are planed to the desired size and contour at the Watertown Arsenal

SOME of the problems that the construction of ordnance apparatus present to the machine shop necessitate the designing of special tools and fixtures, and require both clever engineering and good mechanics to secure the desired results. Such a problem is the machining of the throttling grooves in the recoil cylinders of gun carriages of various sizes. For these grooves must vary in area to control the passage of the fluid used, so as to secure the desired resistance at various points. The grooves vary in gun carriages of different types, but the principle of the operation is the same in all cases. Large-caliber gun carriages have two lengths of recoil cylinders, long and short, and the grooves in the short cylinder are identical with the front end of the grooves in the long cylinder. The remaining length of grooves in the long cylinder is of a different contour for the control of the counter-recoil. Changes in area are secured by varying the depth of the groove at different points, and are accomplished by means of a cam or contour bar as at *A* in Fig. 1. By means of a follower, the cam moves the tool at the other end of the bar, and varies the depth of the groove as the planer table moves the cylinder over the tool bar.

The contour of the grooves is a parabolic curve, and it is essential that the cross-sectional area at each point be accurate. To obtain accuracy within the required limits, a machining tolerance of only 0.001 in. in depth is allowed at each ordinate along the curve. Thus it can be seen that the fixture must be carefully made and that no play or lost motion can be allowed. The saddle *B*, Fig. 1, spans the frame carrying the cam and bears on the under side of the flanges, as shown, thus enabling the spring over the follower to maintain contact with the cam at all times. In Fig. 2 is shown a close view of the follower end. The recoil cylinder is held in housings *C* and *D*, Fig. 1, and is rotated by the worm-

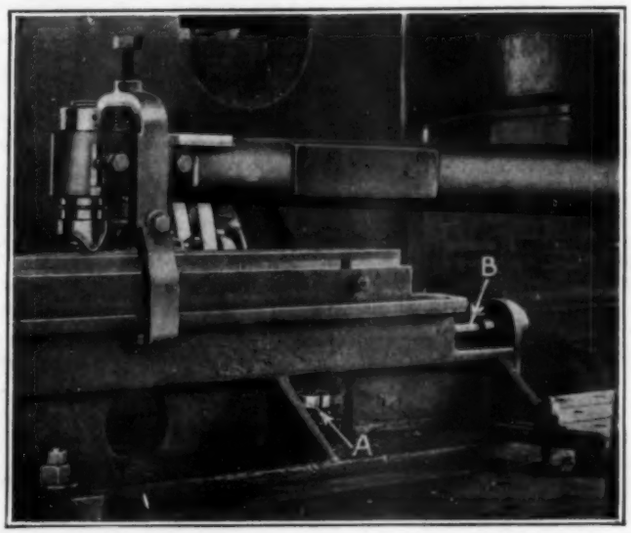
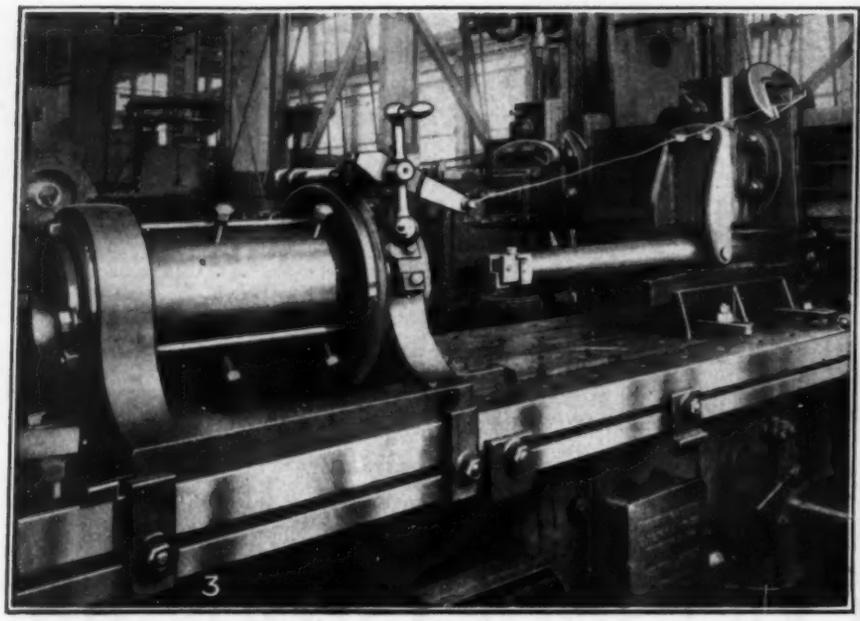


Fig. 2—Details of the follower end of bar



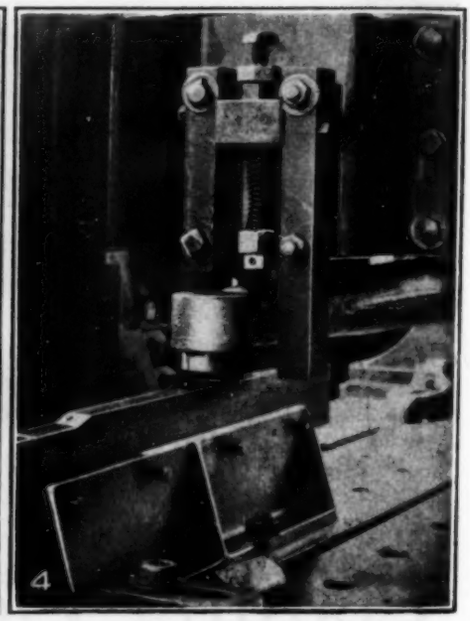


Fig. 3—Bar for planing shorter cylinders. Fig. 4—Another method of supporting follower end

wheel at *C*. The widths and locations of the grooves are controlled by rotating the cylinder in the housings, the desired amount.

Alignment of the housings and cam support is secured by means of integral keys on their under sides fitting in the slots in the planer platen.

At *A* in Fig. 2, is shown one of the leveling screws by means of which the cam is adjusted vertically in its supporting casting, and at *B* is one end of the screw for longitudinal adjustment.

A somewhat similar bar, but for smaller work, is shown in Fig. 3, while the construction of the follower end and the former is shown in Fig. 4. A hardened-steel pin, instead of a roller, is used for the contact between the arm and the cam.

A modification of the method described is shown in Fig. 5, and is for use in short cylinders such as those for use with the recoil mechanism for 12 in. mortars. In this device the toolhead and the cam which controls it, are self-contained in a body that goes inside the cylinder to be grooved. The body of the device fits the inside of the cylinder and the tool head slides in it, as can be seen in the end view at *A*.

The arrangement of the toolhead and cutting tool can be seen at *B*, a micrometer adjustment for the depth of cut being shown at *C*. These parts are also shown dotted at the right-hand end of the view, together with directions for adjusting the tool. The cam is shown at *D*, the following roller at *E*, and the groove at *H*.

Correct location of the slots is secured by the index plate *J*, while *K* shows how the tools must be shaped and set to produce radial sides. Indexing is done by the worm gearing at *L*.

The author is indebted to Gen. Tracy C. Dickson, Commanding Officer at Watertown Arsenal, through whose courtesy this material was obtained.

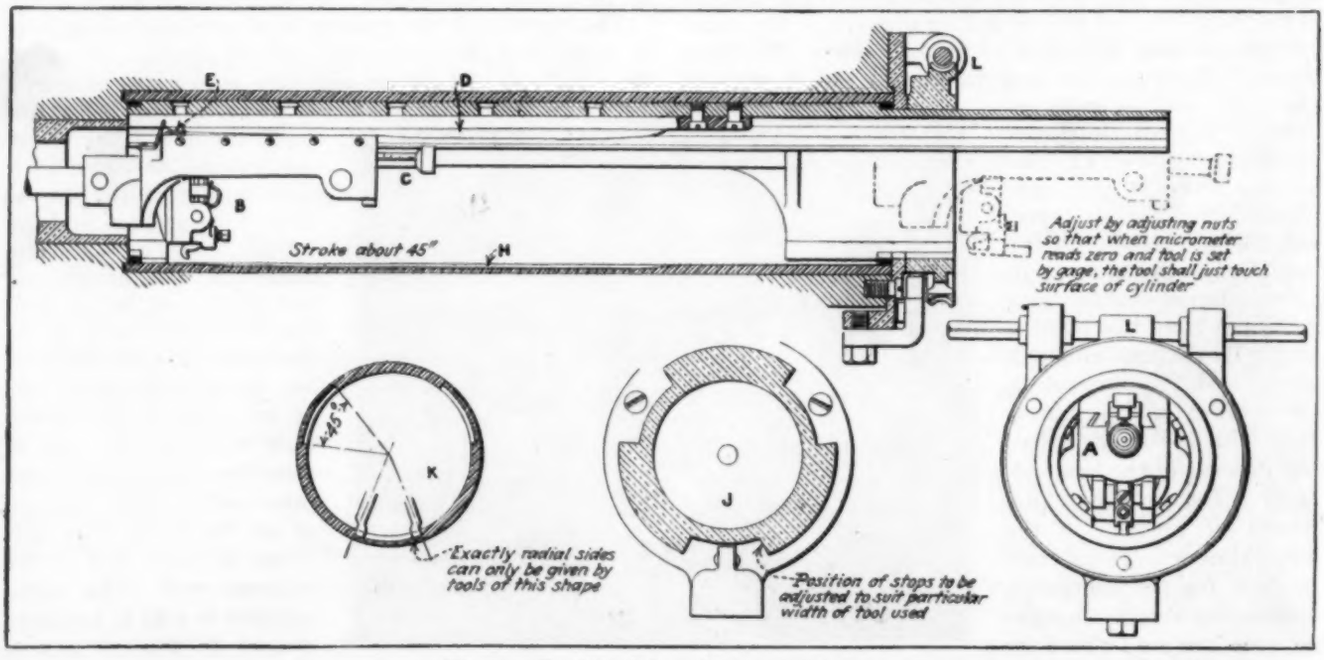

E
D
L
C
B
Stroke about 45"
H
Adjust by adjusting nuts so that when micrometer reads zero and tool is set by gage, the tool shall just touch surface of cylinder
L
A
J
K
Exactly radial sides can only be given by tools of this shape
Position of stops to be adjusted to suit particular width of tool used

Fig. 5—Toolhead for planing contours

Applying Electrical Equipment to Production Machinery

By ROBERT COREY DEALE
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Alternating-current motors, continued—Relation of frequency to speed—General design and chief characteristic of shunt-, series-, and compound-wound direct current motors

SYNCHRONOUS motors are seldom, if ever, used for machine tool drives, but some information concerning them may be of value. They are alternating-current motors, but must have a certain amount of direct current to excite the field. This field excitation is usually furnished by a small direct-connected or belt-driven generator. In Fig. 8, which shows a 75-hp. synchronous motor, the direct-connected exciter may be plainly seen. A synchronous motor in itself has very low starting torque, and consequently some means must be provided to bring it up to speed. The usual method is to have a light squirrel-cage winding on the tips of the rotating poles, and to start as a squirrel-cage motor. After the rotor is brought to about ninety per cent of the synchronous speed, the direct-current field is energized, and the motor comes up to synchronism with the frequency of the line. Once up to speed, it has a very high pull-out torque.

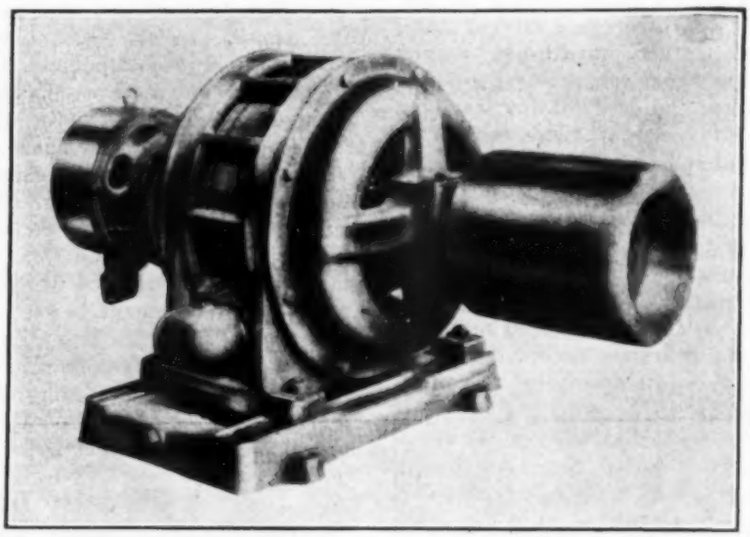


Fig. 8—Synchronous motor, 75-hp.

Its principal advantage is its high power factor, usually a very desirable characteristic. Synchronous motors are not available smaller than 40 hp., while few are in use under 100 hp. A synchronous motor known as a synchronous-induction motor, which combines some of the advantages of both types, has recently been placed on the market. This motor has the high power factor of the synchronous motor, but does not require direct current for excitation from any external source. It is built in moderate sizes, and is a very valuable motor for general purpose application. However, it is not at present adapted for reversing service, and its control equipment is more elaborate than that of an induction motor. To date, manual controllers only have been developed, although automatic controllers will no doubt be built should there be sufficient demand for them. For driving production machinery, it seems to be limited at present to use with those machines that allow the motor to run continuously and that use clutches for starting, stopping, and reversing the machine. In addition to the previously-mentioned motors, which are all adapted for operation on polyphase circuits, there are others that are adapted only for operation on single-phase circuits. These are seldom used in large shops, but are occasionally used on machine tools sold to the smaller shops. These include the repulsion, repulsion-induction, and single-phase induction and series a.c. motors. Repulsion motors have a variable-speed characteristic; that is, the speed decreases rapidly as the load increases and vice versa, thus making them unsatisfactory for any drive requiring a constant speed.

Repulsion-induction motors have a reasonably constant speed under load, and for that reason are usually used where single-phase motors are necessary. Such a motor starts as a repulsion motor and runs as a single-phase induction motor. It may employ a commutator, or it may have a centrifugal switch for changing over to operate as an induction motor. It has good starting torque, but is more subject to trouble than an ordinary squirrel-cage induction motor because of the commutator or centrifugal switch. It should not be used where polyphase power is available. As will be seen from Fig. 9, it resembles the small direct-current motor.

Single-phase induction motors that start split-phase and operate single-phase are not used except in a few

The second article. The third will appear in an early issue.

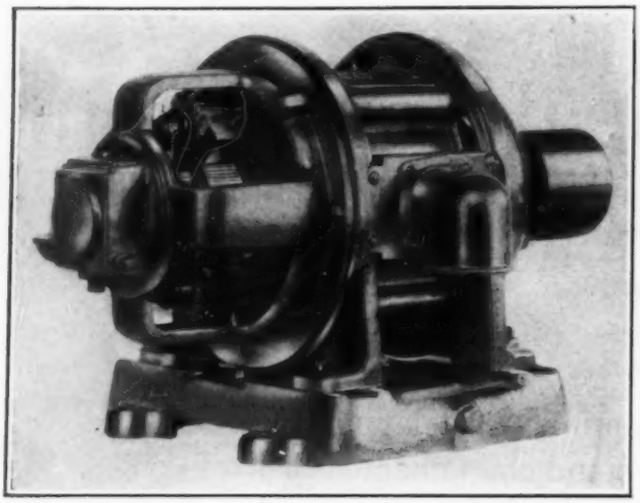


Fig. 9—Repulsion-induction a.c. motor

of the smaller sizes, as they do not have as satisfactory starting characteristics as repuision-induction motors.

Series-wound a.c. motors are usually used where high torque is required for a short time, as for clamping a planer crossrail to the housings or a radial drill column to its base. Fig. 10 shows such a motor used as a clamping motor for a radial drill. These motors are particularly advantageous for clamping service, as they are wound single-phase and will operate on any commercial frequency. They also may have leads brought out so that, by changing external connections, a single type of motor may be stocked and used for any standard shop circuit. The no-load speed of these motors is usually rather high, so that it is advisable to shunt the compensating winding by a fixed resistor to hold this speed within a reasonable limit. This resistor has little or no effect on the stalled torque.

Alternating-current motors, with the exception of synchronous motors, cannot be braked dynamically except by the use of an outside source of direct current. This method is not practical except for large motors, and consequently if a brake is required on a machine driven by an a.c. motor, it must be a mechanical brake, either mechanically or electrically operated. A device has been put on the market to automatically stop an a.c. motor by reversing it momentarily, and then shutting off the power after the rotor has come to rest, but this is not in general use as yet, and it is not known just how reliable it is in operation. Synchronous motors must be braked just as d.c. motors are, if the d.c. field be maintained. This feature is seldom used except as a safety measure, as on rubber mills.

Band or disk brakes operated by an a.c. solenoid are not particularly satisfactory, as they add to the inertia of the motor, have a tendency to chatter, and add another potential source of trouble. The most satisfactory a.c. brake is that operated by a small torque motor, or rotating electro-magnet, as it is called.

The standard alternating-current voltages are 110, 220, 440, 550 and 2,200. The voltages usually used on motors driving machine tools are 220 and 440, with a limited number of 550-volt installations. Alternating-current motors will run satisfactorily on a voltage 10 per cent above or below the rated voltage, but a special motor is advisable if the variation be greater than this. It is usually possible to re-connect a 220-volt motor for use on 440 volts or vice versa, but it is not advisable to attempt to do this with the facilities of the ordinary shop.

If the motor has been designed to make such change-overs possible, as is usually done to simplify production, the change is made by re-connecting the end connections of the stator, which are quite accessible after the front end frame has been removed. Such a change should only be made by the aid of a connection diagram from the motor manufacturer, and preferably should be made by a representative of the manufacturer. Most large electrical manufacturing companies maintain service shops where work of this sort may be done with very little delay.

Practically all a.c. apparatus is wound for single-, two-, or three-phase current. All power for industrial use is generated two or three phase, with the tendency strongly toward three phase at the present time. In distributing the current through the streets of a city, frequently the circuits are split up so that but a single phase of a polyphase circuit is run on a given street. Where this is done, it sometimes happens that a small shop has only single-phase current available. This is the sole case when a single-phase driving motor need be used. Polyphase motors should be used wherever possible because of their superior reliability and lower price.

There is little choice between two- or three-phase motors, except that less copper is required for three-phase distribution, and the general trend is toward three phase. In any case, however, the motor must suit the current obtainable. A two-phase motor will not operate on a three-phase line and vice versa, although a single-phase motor will operate on one phase of either a two- or three-phase line.

The frequencies in most common use in the United States are 60 and 25 cycles, although there are small sections of the country where 50-, 40- and 30-cycle current is used. Usually 60-cycle motors are so designed that they may be used on 50-cycle supply lines, but 30- and 40-cycle equipment is special.

Current of 50 cycles is used more abroad than in the United States, being common in both Japan and Europe.

In England there are many odd frequencies, ranging from 16⅔ to 133⅓ cycles, but, they are of little practical importance, and an effort is being made to discontinue

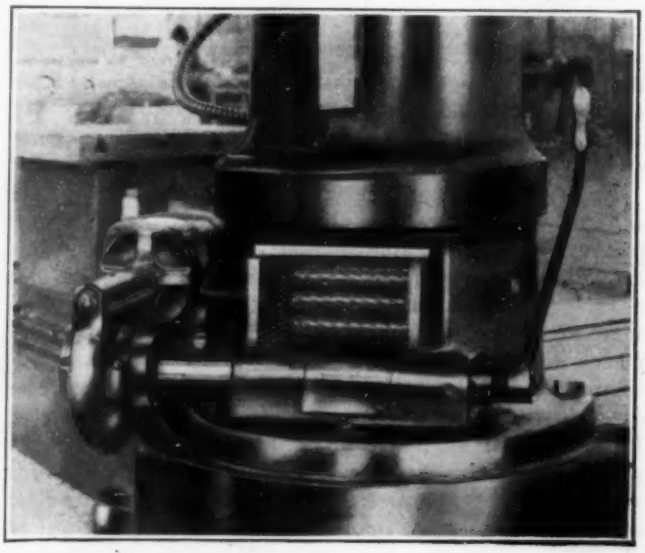
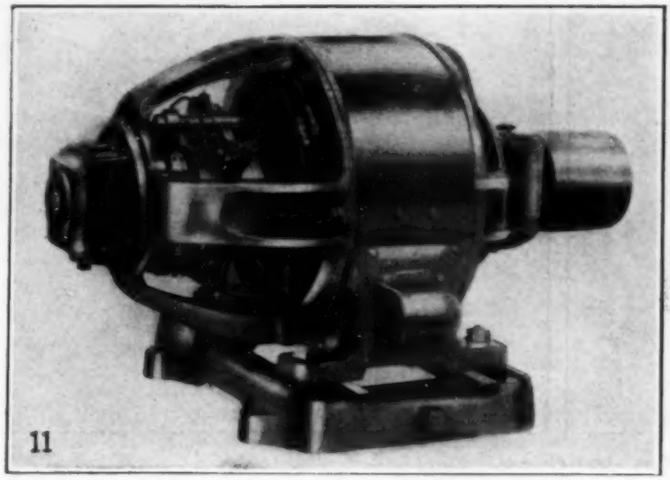


Fig. 10—Series-wound a.c. motor operating a column clamp on a radial drill



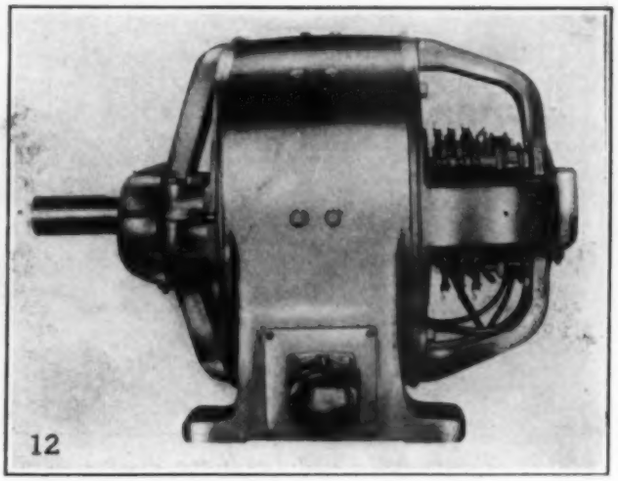


Fig. 11—Shunt-wound d.c. motor, 7½-hp. Fig. 12—Shunt-wound d.c. motor having interpole and distributed compensating windings

most of them, and to standardize on 60- or 50-cycle equipment.

The possible speeds of a.c. motors are fixed by the frequency. The following table shows the no-load or synchronous speeds most generally used, while the full-load speeds will be from 4 to 6 per cent lower:

Poles	60 Cycles	50 Cycles	40 Cycles	30 Cycles	25 Cycles
2	3,600	3,000	2,400	1,800	1,500
4	1,800	1,500	1,200	900	750
6	1,200	1,000	800	600	
8	900	750	600		
10	720	600			
12	600				

It should be noted that these speeds are fixed except in the case of the brush-shifting, adjustable-speed motor, and that, to take a single example, it is impossible to design a 60-cycle motor to operate at 1,500 rev. per minute.

Direct-current motors may have shunt, series or compound field windings, and in addition may have interpole or other compensating windings. Each type of motor has certain characteristics that make it particularly suitable for some applications and undesirable for others. All moderate-size d.c. motors, with the exception of mill-type and crane motors, are very similar in appearance to the 7½-hp. motor shown in Fig. 11, which is shunt wound.

The shunt motor is properly used for applications where a constant-speed characteristic is more valuable than the ability to accelerate a load rapidly. Because of its simplicity, it is used for nearly all applications that do not specifically require a series or compound motor. The stock of shunt-wound motors carried by electrical manufacturers is usually more complete than their stock of series or compound motors.

Few shunt motors are now built without interpole windings, which are used to neutralize the effect of the distorting field produced by the armature current and so prevent sparking at the brushes. This effect may be obtained more effectively by the use of a series winding distributed over the pole faces, but this construction makes the motor more expensive and consequently is used only for applications that throw an unusual strain on the motor, such as is placed on reversing motors for planers. Some manufacturers supply both an interpole field winding and a distributed compensating winding in the same motor. The distributed compensating winding makes the operation of the motor very good indeed, but both the compensating winding and the field windings are repaired with difficulty. A properly designed interpole motor will be entirely satisfactory on any ordinary service within the horsepower and speed ranges for which the motor was designed.

When a shunt-wound d.c. motor is arranged for use as an adjustable-speed motor by the insertion of a rheostat in the shunt field circuit with a constant armature voltage, the maximum speed is generally three or four times the minimum speed, although motors are occasionally built with a six-to-one speed range.

A shunt-wound motor is built in which the pole faces and the armature are slightly conical instead of cylindrical. When the armature is shifted longitudinally, the air gap between the poles and the armature is either increased or diminished, depending upon the direction in which the armature is shifted. The field strength itself is held constant, but its action on the currents

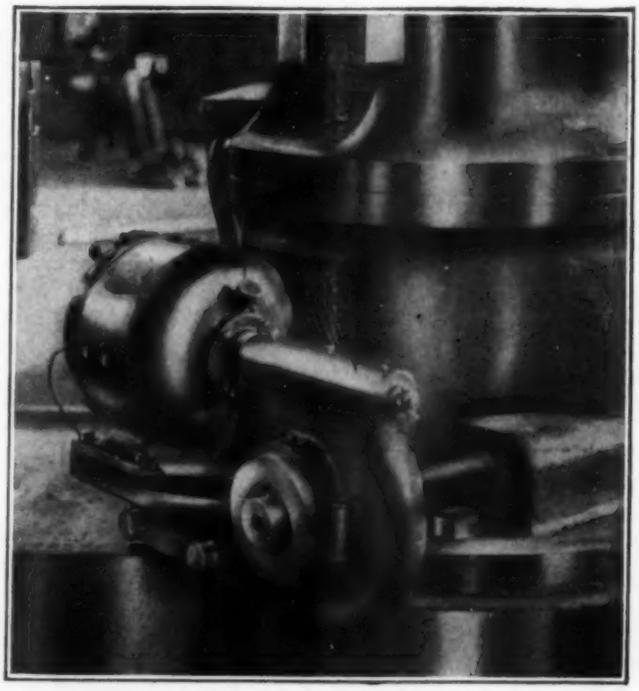
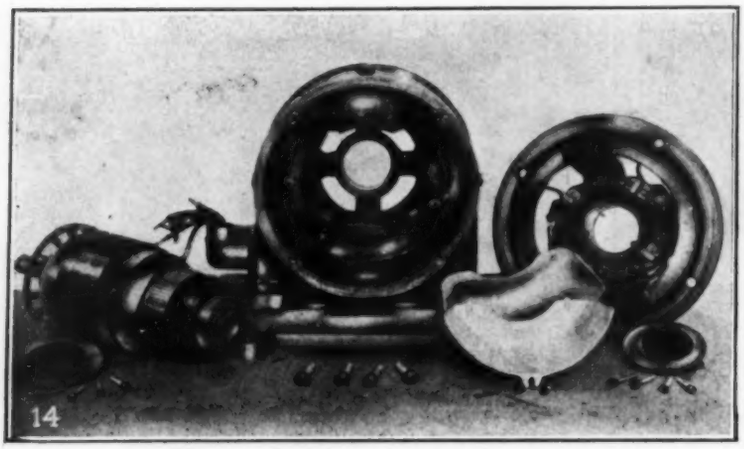


Fig. 13—Series-wound d.c. motor operating a column clamp



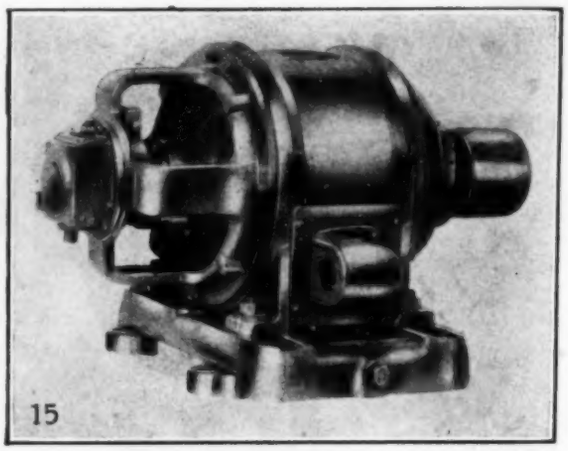


Fig. 14—Compound-wound d.c. motor, disassembled. Fig. 15—Compound-wound d.c. motor of improved design

in the armature conductors is strengthened or weakened. By this means, speed ranges as great as ten to one are readily obtained. The armature may be moved either by means of a handwheel or an auxiliary motor, which may be controlled by push buttons. These motors are not in general use, although the wide speed range that they make available is very valuable at times.

In Fig. 12 is shown a shunt-wound d.c. motor having interpoles and a distributed compensating winding. The front housing of this motor is split to facilitate the removal of the armature. With this construction it is unnecessary to remove a gear or coupling, which may have been pressed on the shaft, before completely removing the armature from the field yoke and housings. It should be noted that most of the motors shown have conduit boxes so that the conduit system may be connected directly to the motor, thus avoiding exposed conductors.

A series-wound d.c. motor is seldom used to drive production machinery, but when so used it should always be directly geared or coupled to the load, never belted or connected through a clutch, as its speed increases rapidly with reduction of load. The converse is also true; that is, the speed drops rapidly as the load increases. If a series motor is completely relieved of its load while it is electrically connected to the supply line, it may run away, and the armature may blow up, as it is called; that is, the speed may become so high that centrifugal force throws the winding out of the slots, bursting the armature bands and wrecking the motor. The appearance of a series motor is identical with that of a shunt motor, although special mill or crane motors may have different frames. It is used very largely for railway service, hoists, and various steel mill auxiliaries. Its only uses on machine tools are for rapid-traversing or elevating some part of the machine or as a torque motor for clamping or unclamping some part of the machine to some other part. Fig. 13 shows such a motor used to clamp the column of a radial drill to the stationary pedestal.

Shunt and Series Motor

The compound motor has both shunt and series field windings, and consequently combines the characteristics of both a shunt and a series motor. The amount of series field winding is stated as a percentage of the total field strength. As usually connected, the series field increases the total field flux, so that, at starting, or when the motor is driving a particularly heavy load, the field is much strengthened with a corresponding increase of torque per ampere of starting current. If the motor is running at normal speed, a greatly increased load thrown on it will cause a reduction in speed, and, therefore, in the horsepower required to carry the load. A shunt motor, which runs at a practically constant speed, would take a greater amount of power to carry the same load.

The series field may also be connected so that it compensates for the drop in speed produced by a heavy load. This construction is not a usual way of connecting motors, nor is it to be recommended, as it is very apt to cause instability of speed unless the compounding has exactly the right value.

Special Windings

For special applications, particularly on planer motors, there may be a series field that is in circuit only during the starting period, although this design is not very common. Another possibility is a special interpole winding for use only during the starting period in addition to the regular interpole windings.

In Fig. 14 is shown a small compound ball-bearing motor, without interpoles, that has been partially disassembled. The shunt and series windings on each field pole have been taped together into a single coil. The field yoke, as is the usual practice, is a steel casting, with laminated steel poles. As may be seen, the motor is provided with a conduit box so that the conduit system may be run directly up to the motor. In this motor the brush rigging is fastened to the front housing, but usually this rigging is connected to a ring that may be moved radially to make it possible to set the brushes in the best position. The armature has a commutator at one end and a ventilating fan at the other as can be plainly seen. The covers shown, made of aluminum castings, are used when a fully inclosed motor is desired. The motor shown in Fig. 15 is of a later type, in which the field yoke is made up of punchings riveted between two cast supporting plates.

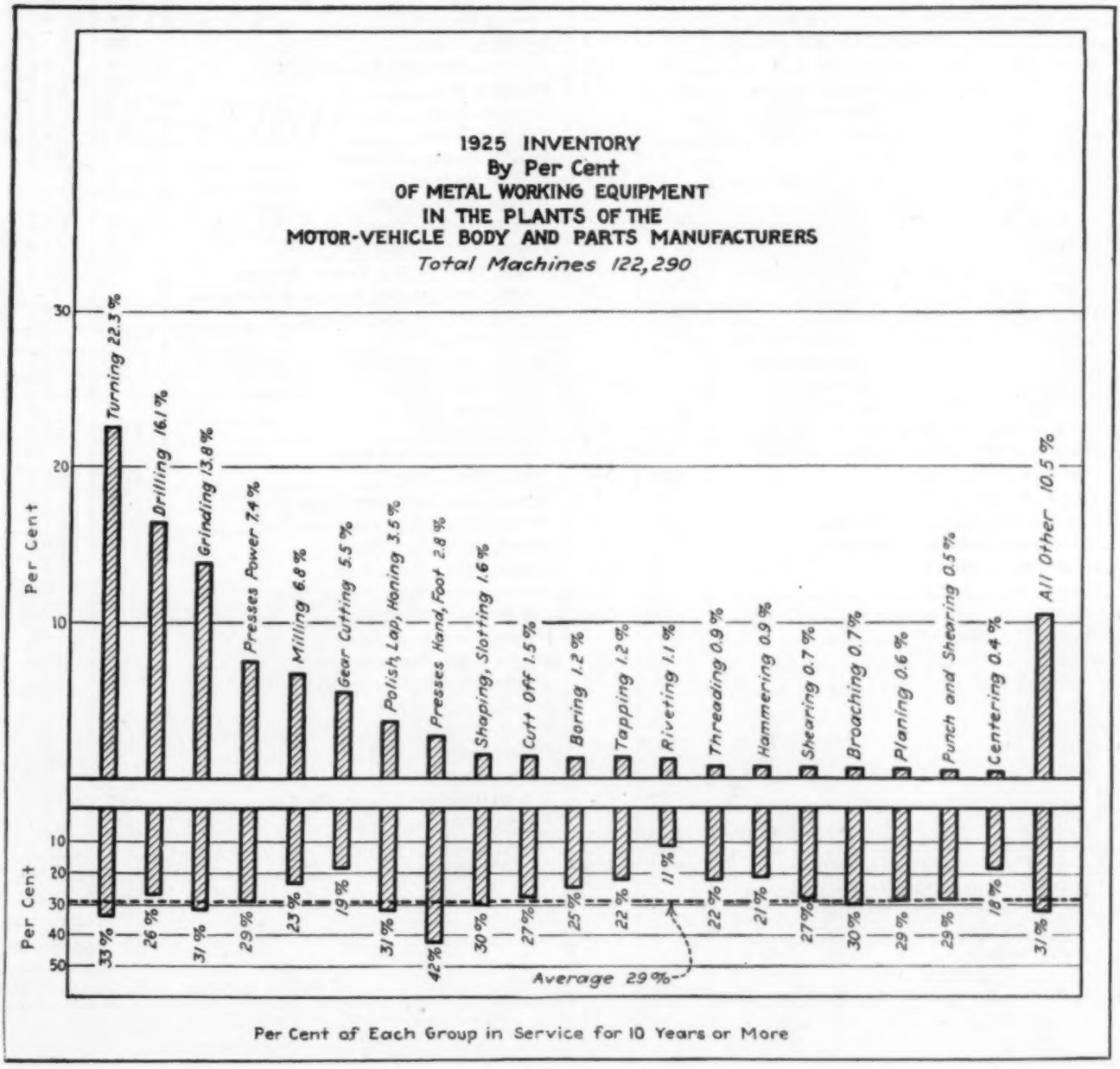
Where it is desired to stop a constant-speed d.c. motor very rapidly by dynamic braking, it is advisable to use either a shunt-wound motor or one with a low percentage of compounding in order to obtain the maximum effort from the dynamic-braking current, which must be limited to the amount that may be safely commutated. It is difficult to connect a series field so that it has any effect during dynamic braking, particularly when automatic controllers are used.

An Industry Based on Metal-Working Equipment

There is nearly one machine per man in the plants building motor car parts and bodies

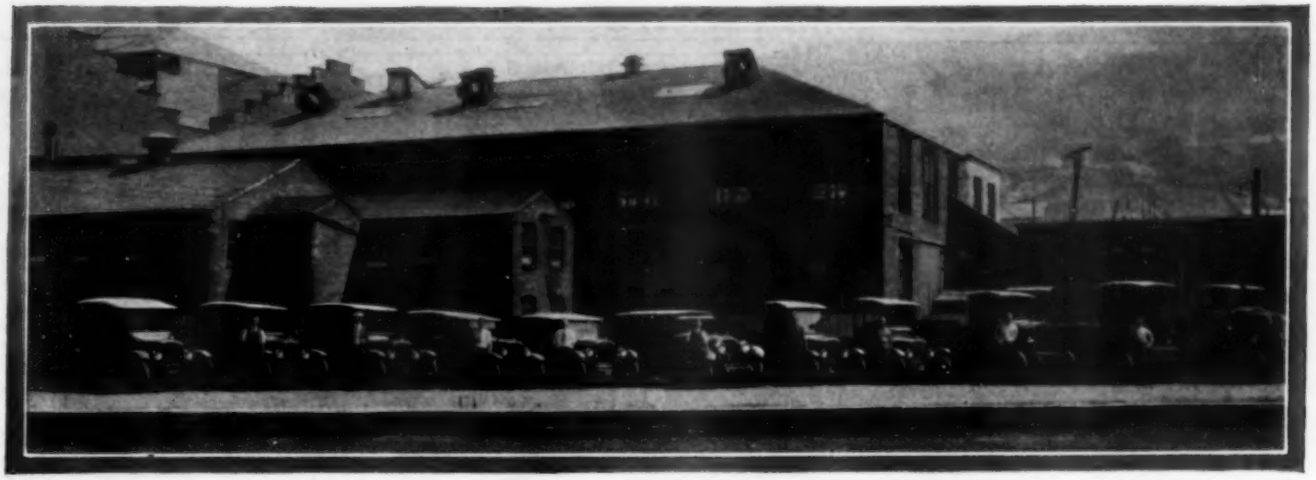
THERE are approximately 122,000 metal-working machines installed in the plants of the motor-vehicle body and parts manufacturers. The plants themselves, which employ 6 or more workers, number nearly 2,100, according to the U. S. Census of Manufactures for 1923. They employ approximately 161,000 men. The equipment count, distributed by types, as shown on the accompanying chart and tabulation, is based on the returns from a questionnaire sent out by the *American Machinist* to this division of the metal-working industry.

The division of machines into groups is given on the chart in terms of per cent of the total count. The relative age of machines in each group is also shown.



METAL WORKING MACHINES IN THE MOTOR-VEHICLE BODY AND PARTS PLANTS

Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925	Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925
Engine Lathes	2745	7765	Grinding Machines, Floor, No Feed Attachments	1150	2725
Hand Turret Lathes	638	2290	Grinding Machines, Bench, No Feed Attachments	80	460
Power Turret Lathes	1452	4445	Grinding Machines, Disk	186	1009
Semi-Automatic Lathes	1060	3660	Grinding Machines, Belt	266	991
Hand Screw Machines	496	1408	Grinding Machines, Centerless	159	442
Automatic Screw Machines, Single Spindle	487	2160	Polishing and Buffing Machines, Wheel	982	3210
Automatic Screw Machines, Multiple Spindle	354	531	Polishing and Buffing Machines, Belt	80	248
Chucking Lathes	672	1495	Polishing and Buffing Machines, Semi-Automatic	9	88
Multiple Spindle Chucking Machines, Rotary Work	44	416	Lapping Machines	230	708
Multiple Spindle Chucking Machines, Rotary Tools	18	71	Honing Machines		9
Speed Lathes	256	566	Cutting-Off Machines, Parting Tool Type	44	97
Bench Lathes	372	867	Cutting-Off Machines, Power Hack Saw Type	248	1025
Tool Room Lathes	531	1531	Cutting-Off Machines, Rotary Cold Saw Type	124	319
Wheel Lathes	—	9	Cutting-Off Machines, Band Saw Type	80	336
Axle Lathes	18	177	Cutting-Off Machines, Friction or Hot Saw	—	27
Forge Lathes	—	—	Shears, Knife	168	549
Hand Milling Machines	416	1673	Shears, Rotary	62	283
Bench Milling Machines	53	115	Shears, Slitting	9	62
Plain (Knee and Column Type) Milling Machines	487	2760	Nibbling Machines	—	53
Universal (Knee and Column Type) Mill. Mach.	513	1912	Hammers, Steam	88	513
Vertical (Knee and Column Type) Mill. Mach.	80	372	Hammers, Pneumatic (not portable)	—	35
Lincoln Type Manufacturing Milling Machines	221	691	Hammers, Drop	80	265
Semi-Automatic Type Milling Machines	44	407	Hammers, Helve	18	35
Continuous Mill. Mach. Rotary or Drum Type	9	133	Hammers, Spring	53	265
Planer Type Milling Machines	27	115	Riveting Machines, Pneumatic	—	469
Gear Cutting Machines, Rotary or Milling Type	416	2210	Riveting Machines, Hydraulic	—	—
Gear Cutting Machines, Hobbing Type	389	1362	Riveting Machines, Steam	—	—
Gear Cutting Machines, Planing or Shaping Type	451	3125	Riveting Machines, Power	142	806
Vertical Boring Mills	146	814	Forging Machines, Hot, Bulldozers	9	115
Horizontal Boring Machines	221	673	Forging Machines, Hot, Forging Machines	71	203
Radial Drilling Machines	154	698	Forging Machines, Cold Headers, Bolt, Nut, etc.	—	—
Upright Drilling Machines, One Spindle	2831	9875	Forging Machines, Cold, Swaging	—	80
Upright Drilling Machines, Two or More Spindles	487	3000	Bending Brakes	106	177
Upright Drilling Machines, Two or More Heads	53	637	Bending Rolls, Horizontal	44	106
Sensitive Drilling Machines, One Spindle	1009	3415	Bending Rolls, Vertical	—	27
Sensitive Drilling Machines, Two or More Spindles	469	1328	Straightening Rolls	—	18
Sensitive Drilling Machines, Two or More Heads	18	389	Punching Machines	159	549
Two-, Three- and Four-way Drilling Machines	44	425	Combined Punches and Shears	18	71
Tapping Machines, Single	283	1327	Presses, Hand, Arbor	460	1869
Tapping Machines, Multiple	35	150	Presses, Hand, Light Punch Press Work	26	27
Pipe Threading and Cutting Machines	18	88	Presses, Foot, Light Punch Press Work	973	1575
Bolt Threading and Cutting Machines	115	407	Presses, Power, Crank Type	2124	7349
Thread Chasing Machines	18	204	Presses, Power, Toggle Type	27	354
Thread Hobbing Machines	35	124	Presses, Power, Double-Acting Type	53	159
Thread Milling Machines	62	301	Presses, Power, Dieing Type	35	97
Thread Rolling Machines	—	9	Presses, Power Automatic	—	186
Planers	195	628	Presses, Power, Trimming Presses	266	442
Open-side Planers	—	44	Presses, Power, Forcing, Arbor, Wheel	97	398
Shapers	513	1619	Presses, Power, Baling	—	35
Vertical Shapers	9	18	Presses, Hydraulic, Bending, Forming, Drawing	9	80
Slotters	44	265	Presses, Hydraulic, Forging	18	80
Broaching Machines	265	885	Presses, Hydraulic, Flanging	8	9
Keyseating Machines	44	212	Presses, Hydraulic, Forcing, Wheel, etc.	18	168
Centering Machines	97	540	Presses, Hydraulic, Baling	—	71
Grinding Machines, Plain Cylindrical	814	2565	Presses, Hydraulic, Extruding	—	9
Grinding Machines, Universal Cylindrical	434	1212	All other machines and miscellaneous	3625	11460
Grinding Machines, Surface, Reciprocating	239	858			
Grinding Machines, Surface Rotating	212	1035			
Grinding Machines, Internal	1185	3132			
Grinding Machines, Cylinder	133	1122			
Grinding Machines, Cutter	345	1282	TOTALS	35,180	122,290



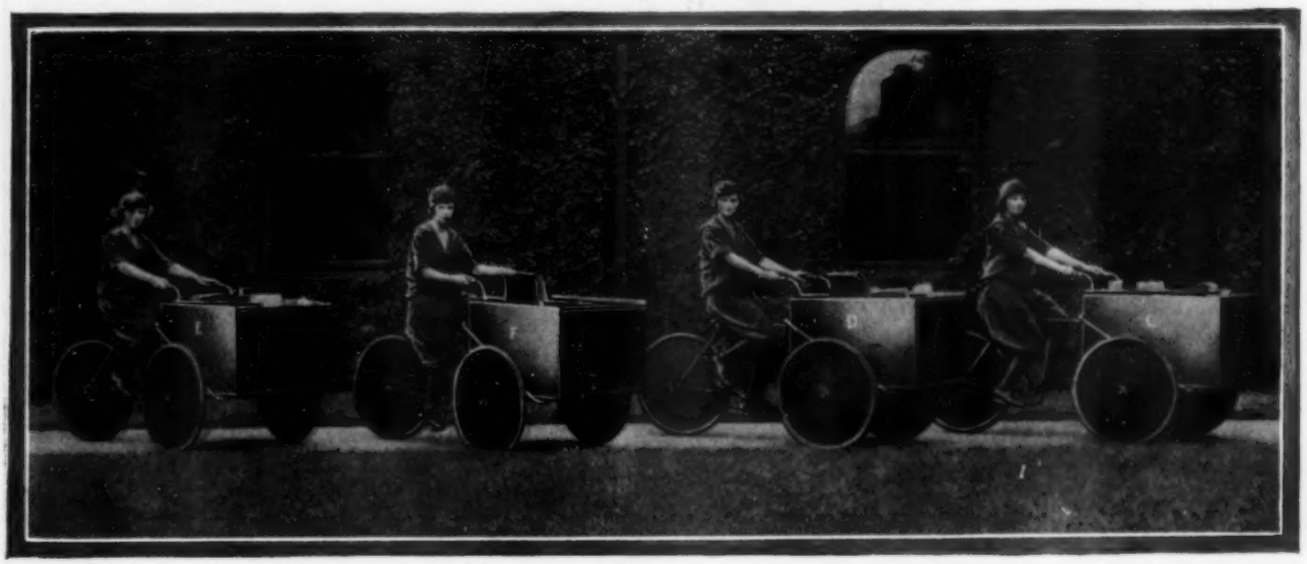
Eight automobiles are kept for transporting executives between the shops that are at some distance from one another. Eleven trucks run on regular schedules between the shops, or furnish quick delivery to local customers. The Shop Express is a company parcel post system. Regular routes about the plant are

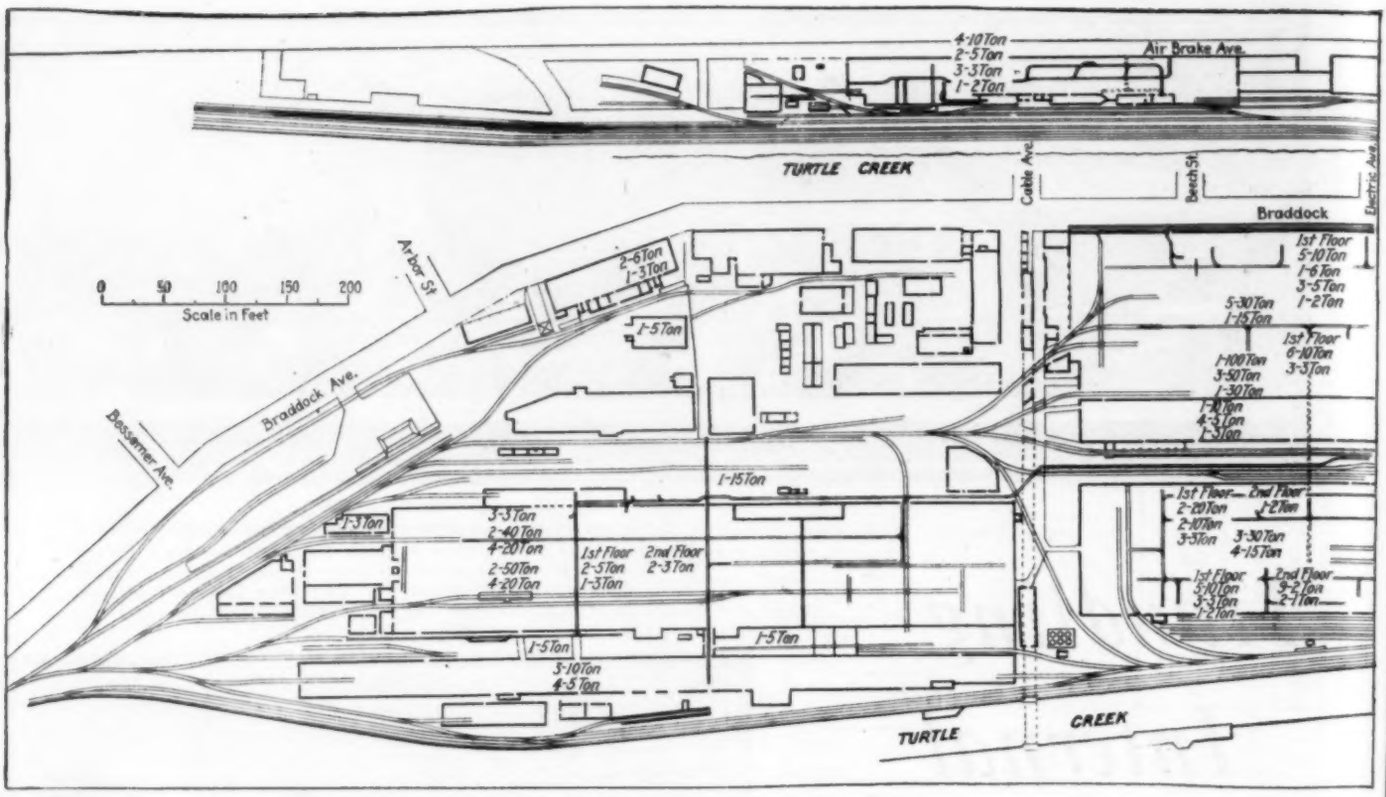
Handling Internal Transport

How one big shop spends 2,000,000 dollars annually on the handling of material within its own plant

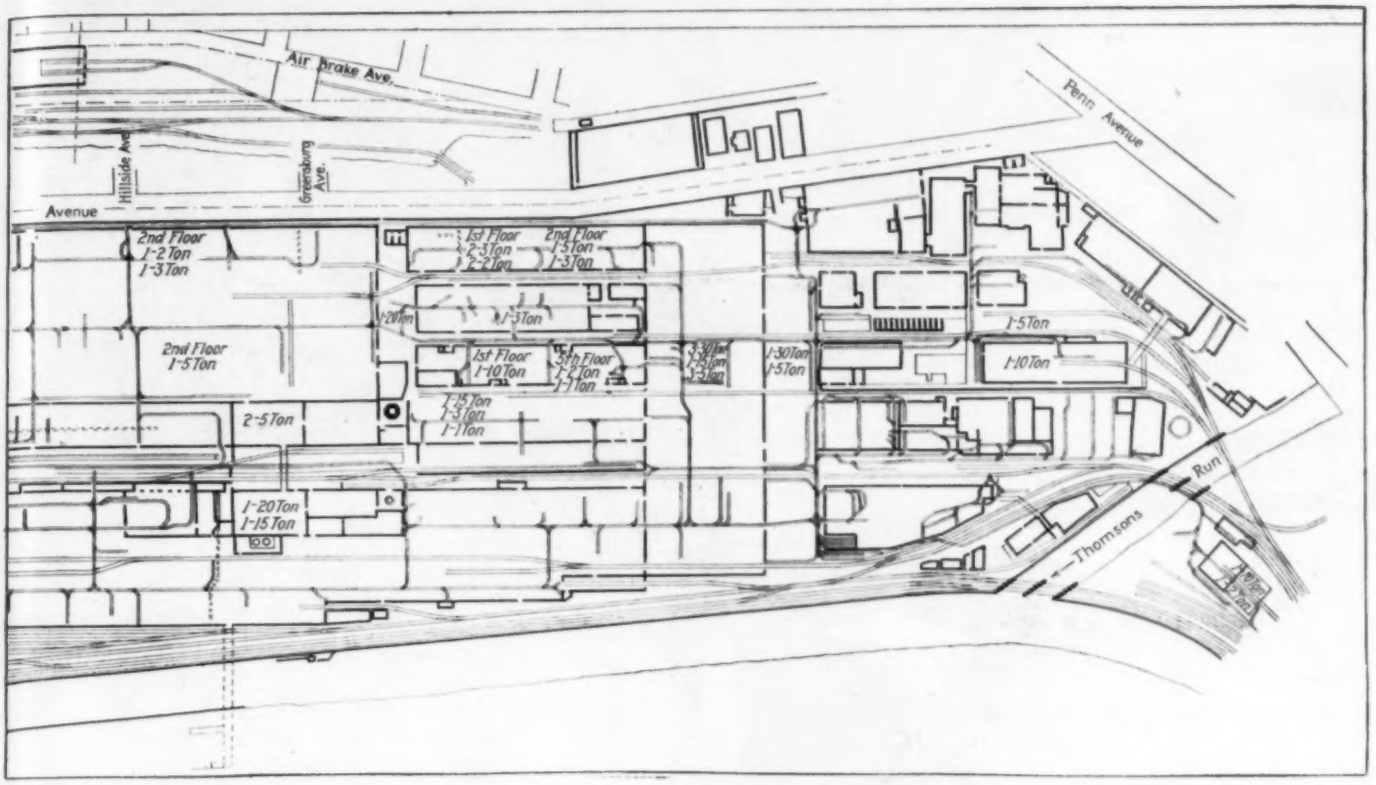
established. About 600 packages are handled daily at an average cost of 3½c. each. Drivers receive a bonus based on speed and care. About 20,000 pieces of mail are delivered about the plant daily. An independent organization of eight mail clerks and five mounted mail carriers insures safe and regular delivery

Photographs submitted by C. A. Fike, Supervisor of Internal Transportation, Westinghouse Electric and Manufacturing Co.





Almost every type of transport equipment is employed at the Westinghouse plant. Standard gage and 21-in. gage railway tracks reach strategic points and discharge or load from cranes, hoists, conveyors or trucks. Trains on the industrial railway are routed through a central classification shed. There are 10½ miles of standard gage and 8½ miles of 21-in. gage track within the limits of the main works. About 600 standard gage car move-



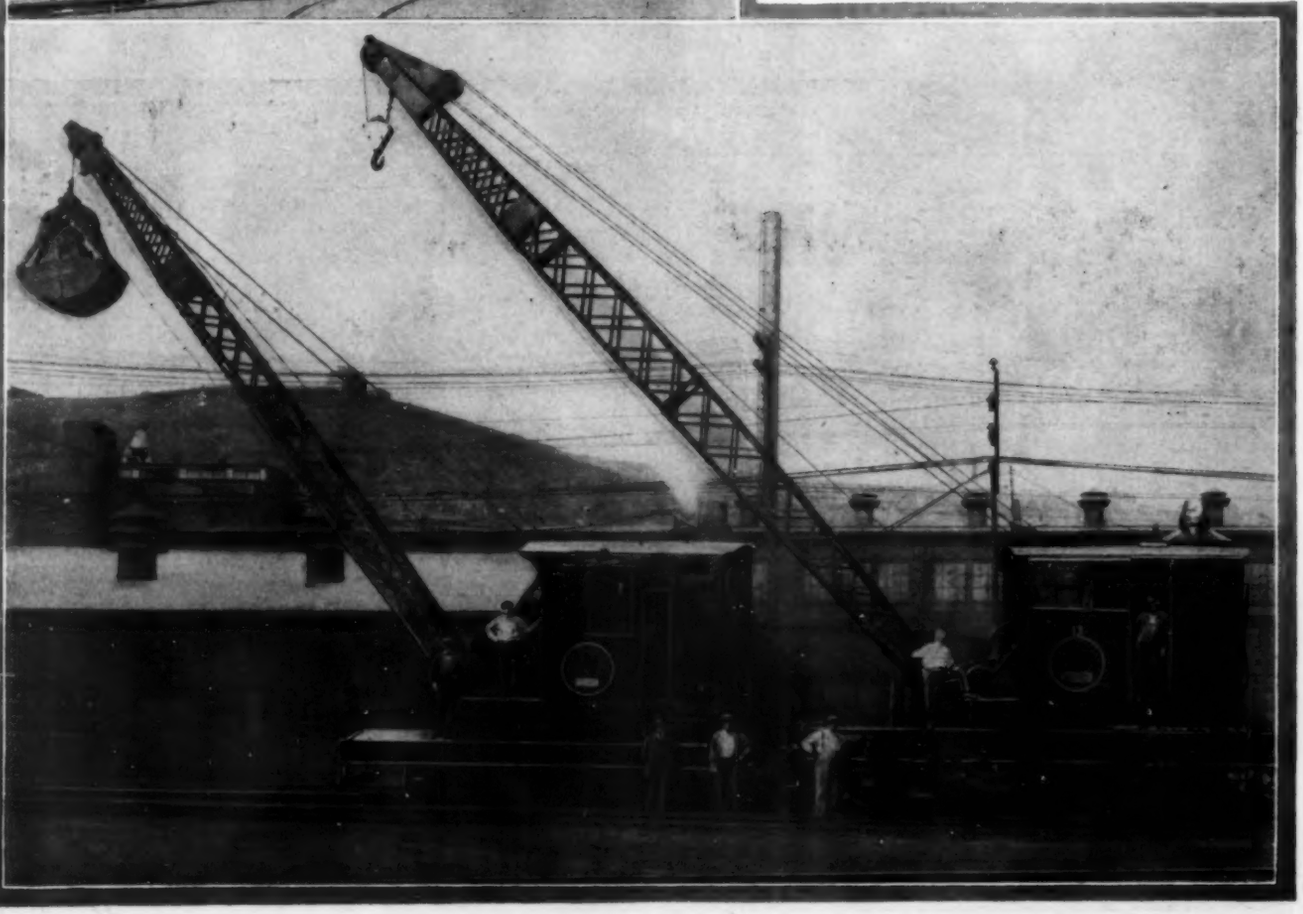
ments and 500 loaded narrow-gage car movements are handled daily within the plant

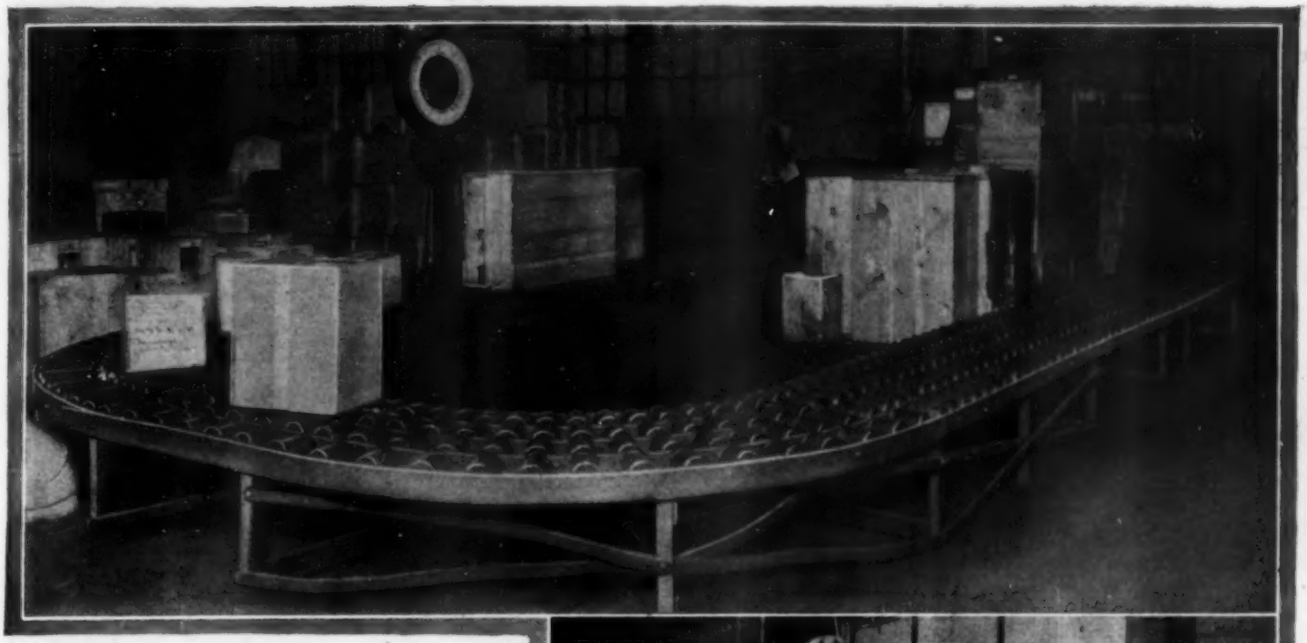
Cranes to the number of 172 are located throughout the buildings and yards. These cranes have varying capacities up to 100 tons. Electric traveling cranes serve the heavy storage yards, and feed directly to cars and trucks. The heaviest piece of material can be transferred to any point with a minimum of labor.

Five standard gage locomotives and 100 freight cars are owned by the company and operated within the plant. A passenger train is run regularly between the main works and the brass foundry, and the company also operates a daily employee passenger train

Conveyor slides replace elevators for quick outside loading or unloading

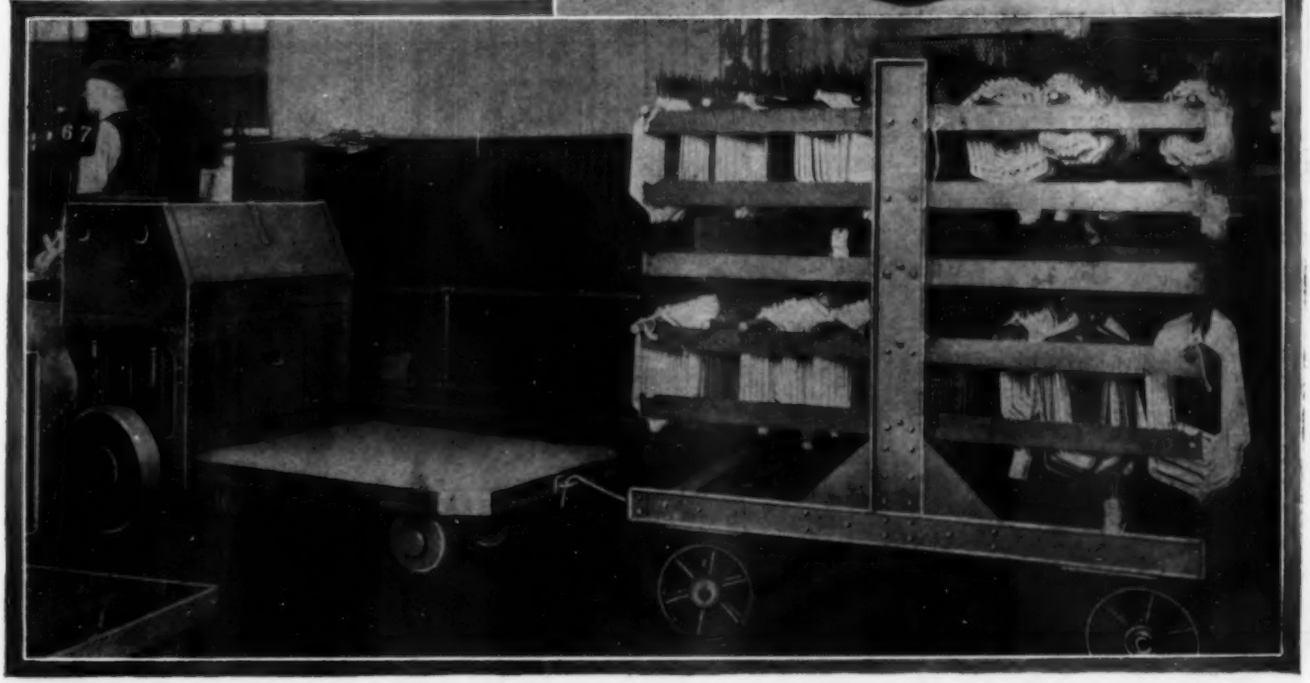
Three locomotive cranes are in continual use on construction and clean-up work

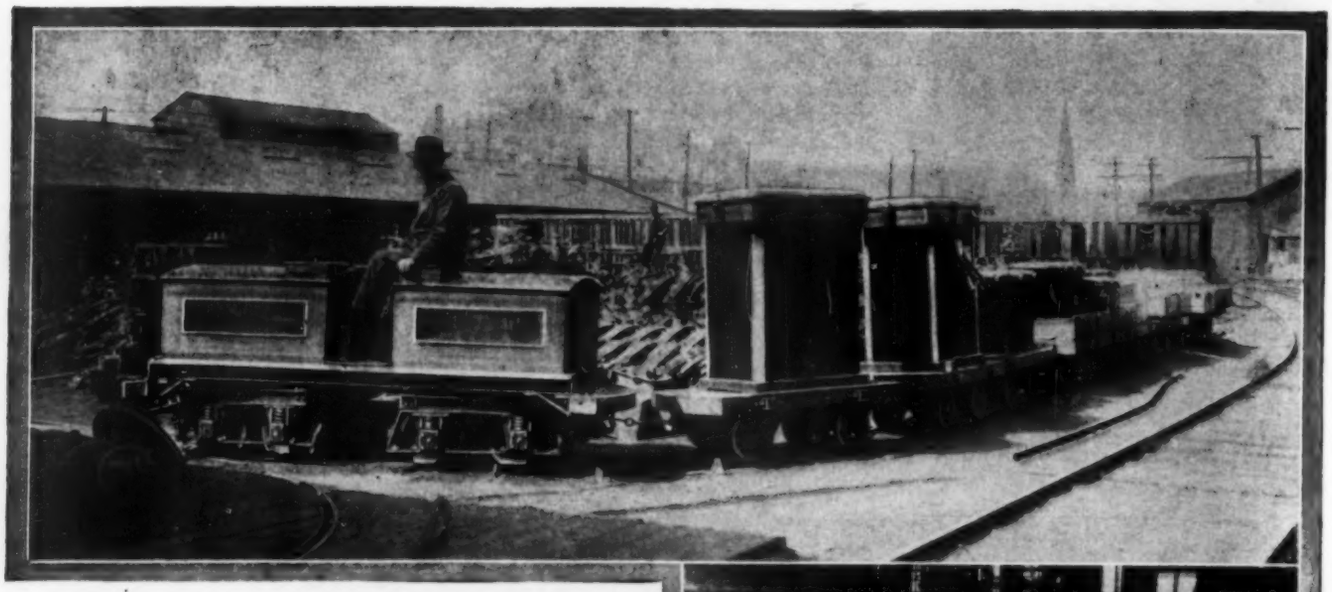




Conveyors are used for manufacturing operations and in the packing department. Weighing of outgoing boxes is done on the roller conveyor without extra handling

Industrial electric-battery trucks are used for irregular service between departments. The company has 85 of these trucks in continual operation. They have plain platforms or special bodies. Trailers, that are also special work holders, are moved by these trucks. Control of the electric truck service is maintained through dispatch stations

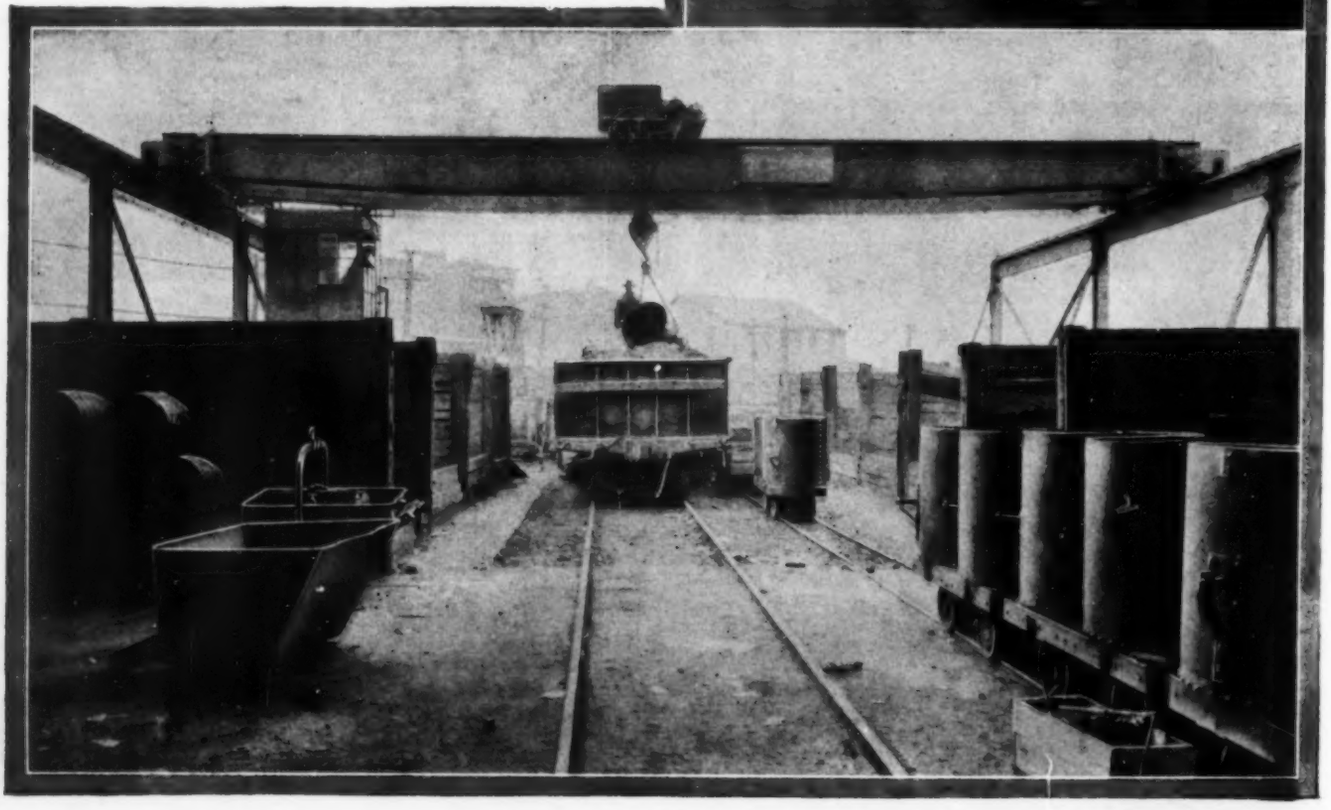




Eleven storage battery locomotives serve the plant industrial railway, carrying trains of 2½ and 5-ton cars. Trains are made up to 25 tons of carrying load

Tote boxes are in general use for handling and transporting small pieces in all stages of operation. These boxes fit conveniently on all cars and trucks

Scrap material forms a big item of miscellaneous handling, and the scrap yard is organized to include all of the outside means of transport



Two Denver & Rio Grande Driving Box Fixtures

By L. C. Morrow
Managing Editor, American Machinist

TWO special fixtures used at the shops of the Denver & Rio Grande Western Railroad at Salt Lake City, Utah, are shown in Figs. 1 and 3. The first is used in boring driving-box brasses and the second in machining driving-box shoes and wedges on either a planer or a milling machine. Both fixtures were designed and built at the Salt Lake City shops. The driving-box fixture is a two-jaw, universal chuck and can be operated from either side. Crosswise adjustment is provided, the slide being gibbed. After the driving box is tight between the jaws, the four setscrews are tightened against its sides. The assembly drawing of the fixture, Fig. 2, shows the overall dimensions.

It will be noticed that leather covers have been attached to the rear of the jaws to keep chips and dirt away from the clamping screws. Between the jaws a sheet metal protector is provided. Under this cover is a tapped hole for the insertion of an eyebolt when the chuck is to be moved. Details of the stands used on the shoe and wedge job are shown in Fig. 4. Serrated plates of tool steel are held by

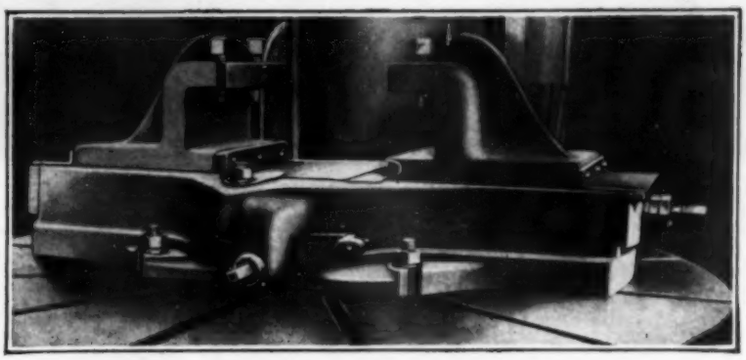


Fig. 1—Chuck used in boring driving-box brasses

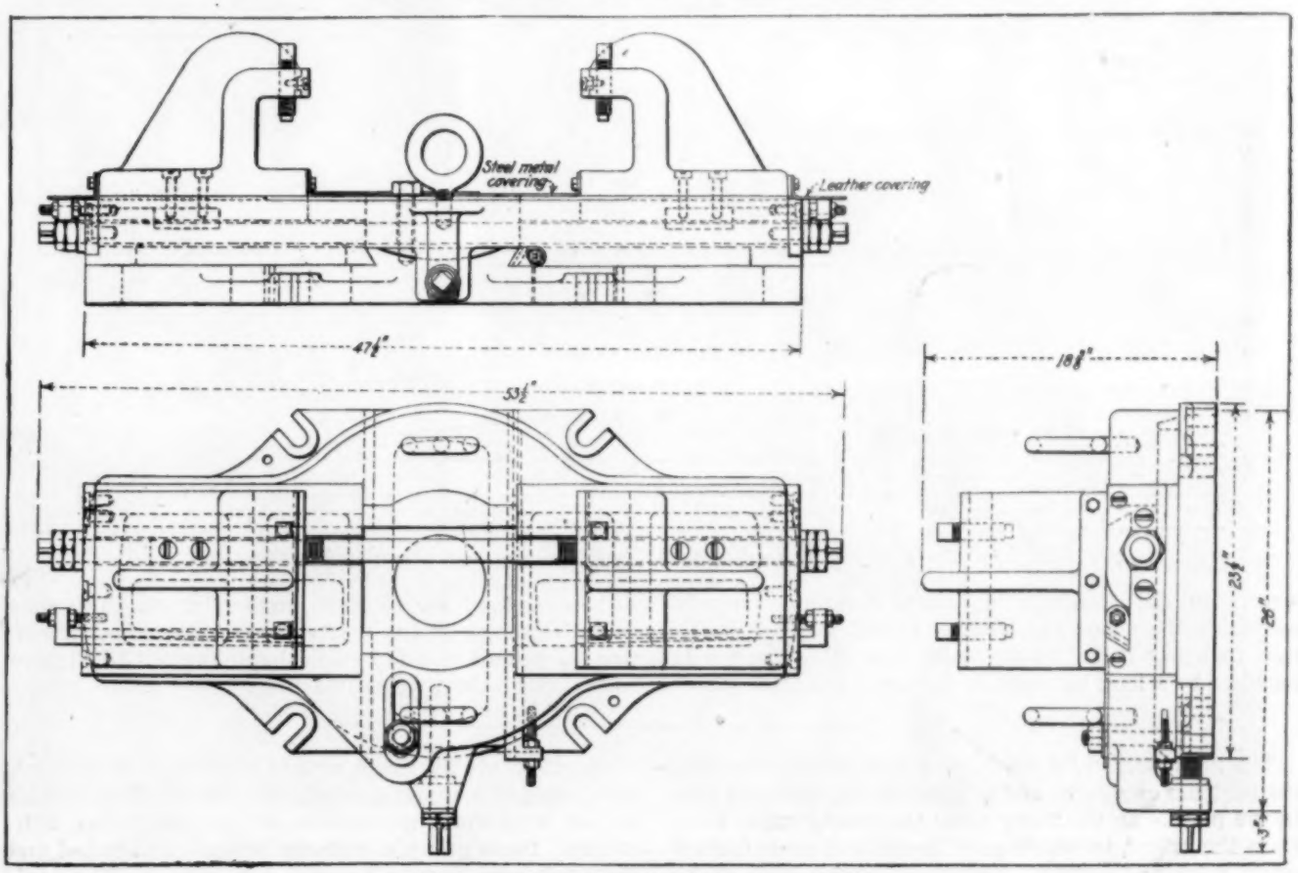


Fig. 2—Assembly of driving-box chuck

Fig. 3—Milling driving-box shoes

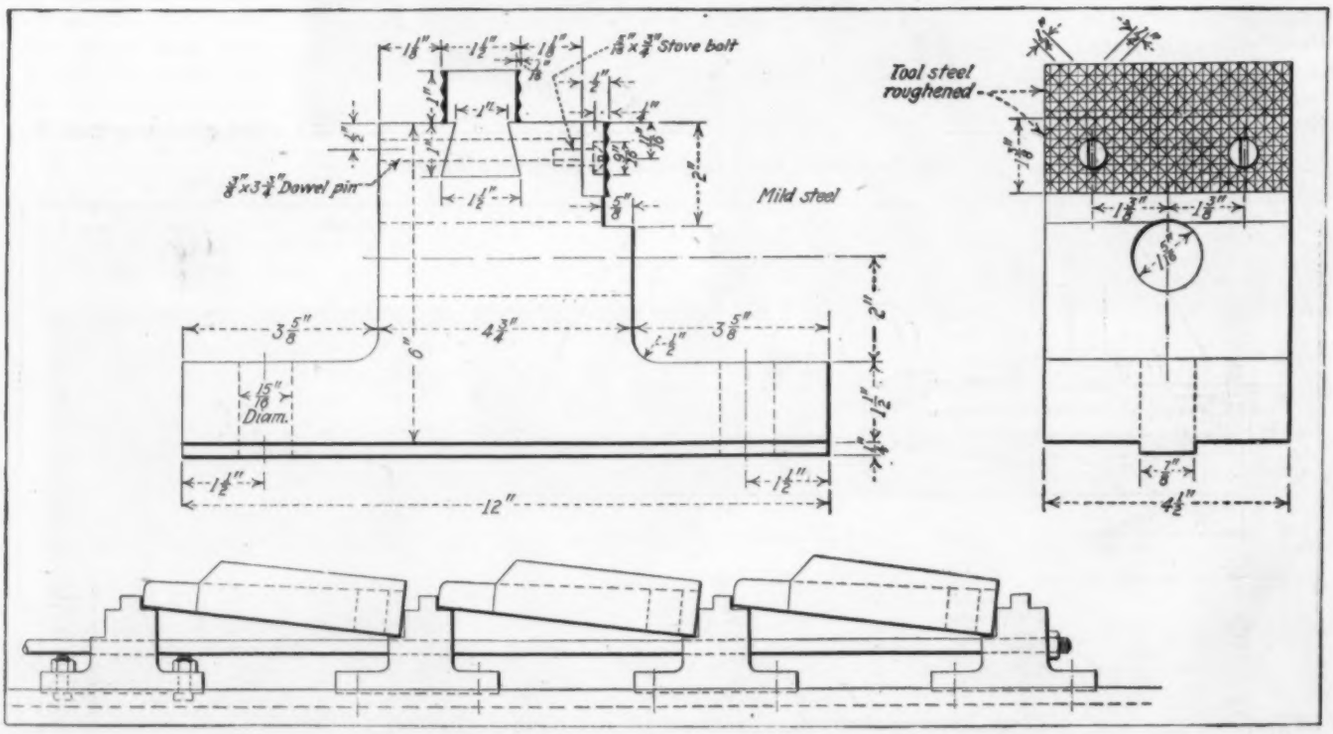


Fig. 4—Details of stand used in machining driving-box shoes and wedges

screws to the stands, and afford clamping surfaces on which the shoes and wedges cannot slip. In addition to being bolted to the table, the stands are held together by a long bolt that is tightened after the pieces to be machined are in place in the fixture. The shoe set-up is shown in the halftone and the method of setting-up wedges is indicated in the line cut. This fixture has proved to be very satisfactory.

The most successful manager is one who appreciates the part his engineers and production departments play in the plant. In too many cases the management overlooks the extent to which good design and manufacture offset sales and profits. Because salesmen seem to be the direct link between the customer's pocketbook, they frequently have too much weight with the management. New designs are put through to satisfy salesmen who do not appreciate mechanical or manufacturing difficulties. Costs go up, customers become dissatisfied and the whole organization becomes demoralized. The engineer isn't always right, but don't pass him by.

Automotive Production

Manifolds in the Making

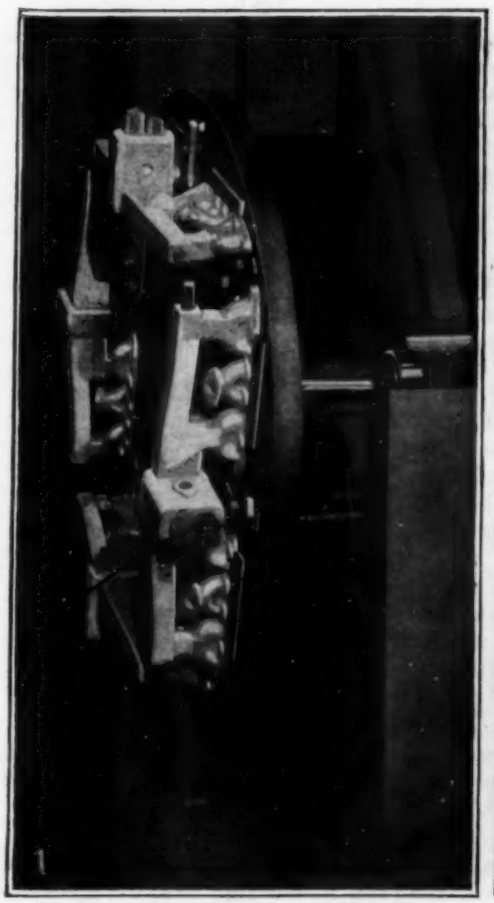
By Fred H. Colvin
Editor, American Machinist

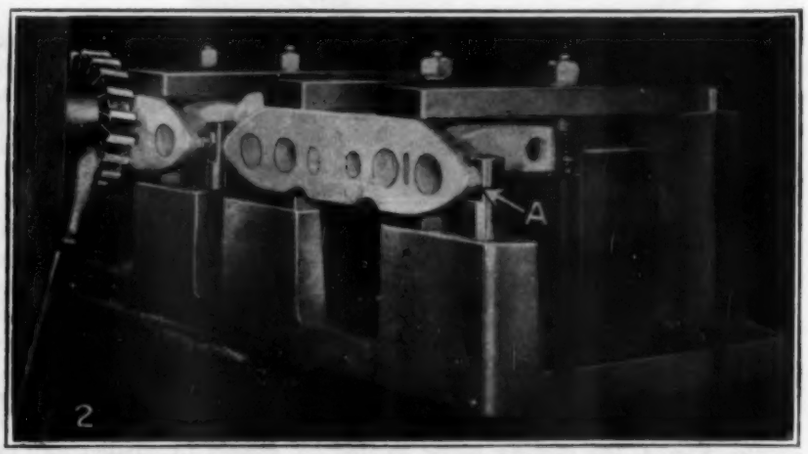
Two types of manifolds and how they are located and clamped for machining—Cleaning the insides by tumbling—Milling operations require special fixtures

AFTER striving to get easy curves in manifolds to aid the flow of gas, it seems strange to see the angles and sharp corners in the manifolds of the Swan system, now used on the Stutz and other engines. One type of these manifolds is shown in Fig. 1, where four of them are mounted on a large wooden disk for tumbling. Small stars, shot and broken hacksaw blades are put in the castings, the core opening plugged and the manifolds strapped to the disk as shown. The disk is then revolved until the cored passages in the manifolds are clean.

After the outsides of the castings have been wire brushed and filed, they are water tested for leaks, after which the joint surfaces are milled on the Milwaukee machine in Fig. 2. The casting is clamped by the sides of the flanges and is located by the bolt bosses which bear against the flattened surfaces of studs, as at *A*.

Locating the manifold from the joint surface, the





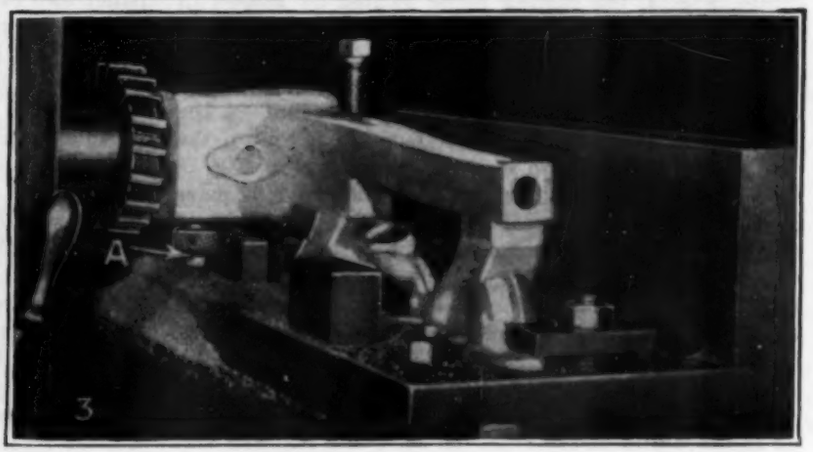


Fig. 1—Special tumbling device for Stutz manifolds. Fig. 2—Milling the joint surface
Fig. 3—Second milling operation

Automotive Production

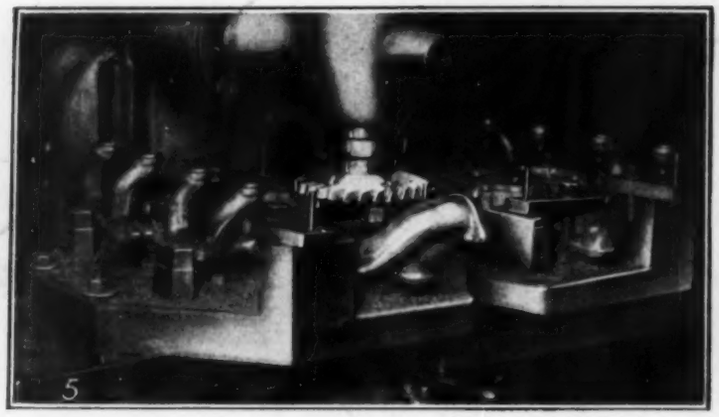


Fig. 5—Milling fixture for Hupp manifolds.

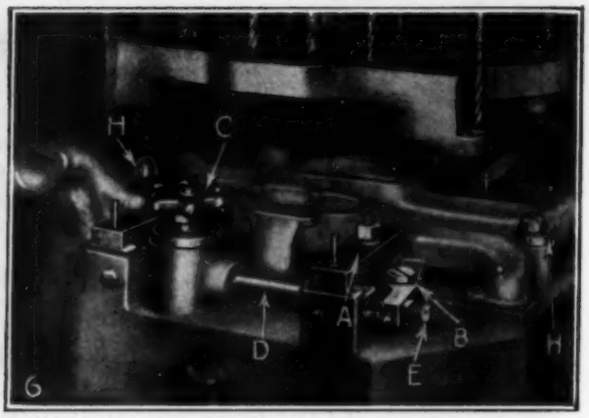


Fig. 6—Drilling the manifold

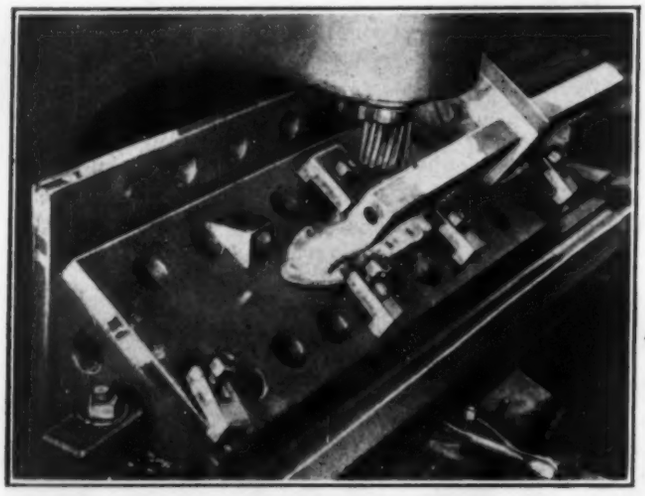


Fig. 4—Milling the angular joint

lower end of the center chamber is surfaced as in Fig. 3 to receive the carburetor. A study of this fixture shows how the casting is clamped and supported by the screw jack *A*, directly under the milling cut.

After having the twenty-two bolt holes drilled, the angular surface is milled in the Milwaukee vertical machines, Fig. 4, the casting being located by dowels in the bolt holes and held by the straps shown.

The average manifolds, both intake and exhaust, for automobile engines are more awkward pieces to hold for machining than those just shown, on account of the many curves and angles. A good example is that of the manifolds for the Hupp engine. As shown in Fig. 5, they are of unusual shape and are machined in pairs in double fixtures on a Milwaukee milling machine. A manifold of each kind is held in each fixture, the intake manifold is inside and the exhaust manifold is at the end. The operation is the milling of the joint around the opening in the center of each. The cutter is about to start milling the surface at the left.

The drilling of the manifolds requires special fixtures as shown in Fig. 6. Here they are held by clamps both on the tops and at the sides, as at *A* and *B*. The side clamps are quick acting, being controlled by the hand knob *C* through the rod *D*. The pressure can be adjusted, when necessary, by the setscrew *E*. The bushing plate is piloted at each end by studs, as at *H*.

These fixtures show the necessity for having definite locating points that can be used in all essential operations. It usually happens that one of the regular bolt holes can be reamed and used for this purpose—but it is sometimes better to have two larger holes, even if they serve no other purpose.

Dog-Point vs. Cup-Point Setscrews

By Frank Mack

ONE of the aggravating conditions that mechanics have to contend with, is set up by the use of cup-point setscrews. The circular contact of the cup-point is so small, particularly on round shafting, that it is practically of little value even though a flat spot be made on the shaft for a seat.

Many men are under the impression that it is the point of a setscrew that does the holding. It is a known fact that the compression between the hub of a gear or pulley and the shaft is what does the holding. In trying to create this compression with a cup-point setscrew, the result is that the point digs into the shaft and raises a burr. When considerable strain is put on the pulley, or gear, it slips, and the point cuts a groove around the shaft. Then the sledge hammer, the wheel puller and even the hydraulic press may be required to remove the pulley or gear, resulting in spoiling either the bore or the shaft, or both.

The oval-point setscrew is better than the cup-point, the one with the dog or flat point beats them all. Step up to a lathe and look over the lathe dogs—all of them have dog-point screws, because they produce greater compression where the V-shaped part of the dog comes in contact with the mandrel. Therefore, in my opinion, the dog-point setscrew is the best for all purposes.

It is suggested that nominal piston ring width shall be of the basic dimension with a tolerance of plus 0 and minus 0.0005 in.

When a railroad club listens to a paper on aviation, as was recently the case, it is a sign that the members are alive to the possibilities of the new method of transportation. The Canadian Pacific Ry. time table also contains a connection with air service.

Automotive Production

Abstracts

from other publications

Grinding 1,000,000 Pistons Annually

Conservative estimates place the total piston production for automotive engines in the United States at 25,000,000 annually, including, of course, pistons used on new work as well as those for replacement purposes in repair shops and garages. One of the largest manufacturing companies devoted exclusively to the making of pistons has a production of about 1,000,000 each year.

A large part of this company's product consists of aluminum alloy pistons. These are rough-machined on turret lathes, the holes for wrist-pins are drilled and reamed in jigs, and the outside diameters are finished by grinding. An engine lathe and a plain grinding machine are arranged so that one man can operate both. He puts a piston in the lathe for turning, and while that operation is in progress he pays attention to the grinding machine.

It is considered necessary to finish the top of the pistons in order to provide a smooth surface which reduces carbon formation materially. In this plant the operation is performed on a plain grinding machine with the headstock set at right angles with the wheel. The work is located in a special fixture and is rotated about 16 revolutions per minute.—*Abrasive Industry*, December, p. 365.

Trend in English Automobiles

The Olympia Automobile Show in London showed several interesting tendencies in design. Bodies are larger and engines are more powerful and faster. The popular size is a nominal 15 hp. that develops anything up to 60 hp., about 126 in. wheelbase and capable of carrying four or five people 50 to 60 mi. per hr. Some of the engines run 3,000 to 4,000 r.p.m. Six-cylinder engines have grown to a total of 35 per cent of those exhibited, and smaller sixes are expected next year. Straight eights have not found favor.

Several superchargers were shown but are not considered a commercial proposition on account of the costs being about as great as added cylinder volume. Battery ignition is making its appearance, as well as the automatic spark advance but British made magnetos are much in evidence. Sleeve valves were shown on about 10 per cent of the engines. Anti-vibration devices are in evidence, both to prevent vibration and to absorb it. Light pistons and connecting rods, counterbalanced crankshafts and bearings between each crank throw help reduce vibration. Dampeners of various kinds to absorb oscillations are being developed and rubber is used for engine and other supports and for joints in rotating shafts.

Cone clutches are giving way to single or multiple disc types; gear boxes are generally smaller and in a unit with the engine. Tubular propeller shafts with fabric joints predominate. Frames are deeper to support the longer cars. Spiral bevel gears are being tried for rear drive but some feel that a return to the worm drive is probable.

Four-wheel brakes are growing in favor with increased diameter of brake drums. Servo-mechanisms, whereby a power device driven from the transmission aids the muscular effort, is not seen on passenger cars. Closed, or saloon cars, are increasing in number, many carrying a trunk as regular equipment. Details of construction of many cars are given.—*The Automobile Engineer*, Nov. 11, 1926, p. 316.

Duralumin and Corrosion

Duralumin as now made is subject to corrosion unless properly protected. The thin sections used in aircraft require protective coatings to prevent deterioration and failure. As moisture is the corroding medium the parts must be waterproofed. Consideration of the problem involves preliminary work on the metal, the coating itself and its effect on the duralumin. In general, oils, paints and varnishes answer the purpose.

The weight of the coating is important as is the cost. Two cents per sq.ft. is considered reasonable. The finishes must be able to resist shop wear and usage. Oils are relatively heavy, they do not last and do not make a desirable covering.

In preparing duralumin for finish a revolving scratch brush is used having wire about 0.005 in. For sandblasting use No. 100 sand and low air pressure. Chemical cleaning is done by dipping in a hot caustic soda solution for 2 or 3 min. or longer, if cold. It is then dipped in a boiling solution of 253 parts sodium hydroxide, to 1,000 parts of water, by weight, for 2 or 3 min., washed in cold water, and dipped in concentrated nitric acid to neutralize the caustic dip. It is again washed and dried on steam tables.—Lt. Com. Wm. Nelson, U. S. N., in *Aviation*, Nov. 8, 1926, p. 795.

Germany Drops Four Cylinder Cars

A review of the German automobile field shows that the four-cylinder engine has been almost entirely discarded except for low-priced cars. Of 17 new models, 14 are 6-cylinder, one is a straight-8 and only two still use the 4-cylinder engine. There are only two 8-cylinder engines built in Germany, both of them of "in-line" design. Engine speeds vary from 2,200 to 2,800 r.p.m., depending on the size and class.

Eight of the new 6-cylinder cars have 7-bearing crankshafts. They also have the latest improved details such as air and oil filters, ignition, unit power plants, etc. Single disk clutches are gaining ground and gear boxes are being simplified. Torque take-up by rear springs, fabric universal joints and four-wheel brakes are also much in evidence. Superchargers are only found on the highest priced cars.

Motor trucks have not developed rapidly owing to unfavorable economic conditions. Buses, however, are receiving much attention, one 6-wheel chassis being fitted with a 70-passenger body. Gas-electric drive is also being tried out. One four-cylinder bus engine has a cylinder block of silumin, provided with steel liners.—Edwin P. A. Heinze, in *Automotive Industries*, Dec. 9, 1926, p. 958.

THE · FOREMAN'S · ROUND · TABLE

Helping Your Men Get Better Jobs

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"YOU must be getting weak in the upper story, Al!"

"What's the symptom this time, Ed?"

"Why, I hear you got Tom Jackson a good job with the Johnson Motor Co. and urged him to take it. What's the idea of losing a good man after you've trained him up to be a sub-foreman? You told me yourself he could handle your department any time you wanted to be away."

"He was a darned fine chap, Ed—and I'm sorry to lose him. But it was the only fair thing to do. I talked it over with Williams and while he balked at first—he finally said to go ahead."

"But don't you want a good understudy, Al?"

"You bet I do—and I've got my eye on another chap who'll come through all right, I'm sure. But Tom Jackson was too good a man to hold back when there was a good chance for him over at Johnson's.

"I asked Williams if we had any opening ahead for Tom, so we could have a real reason for holding on to him. He looked the field over and found that, barring accidents, there wasn't likely to be a chance for a year at least. So he finally said to go ahead and give the boy his chance. Tom certainly appreciated what we did."

"If I was Tom, Al, I might have a hunch you wanted to get rid of me—and I wouldn't like it."

"You wouldn't be as dumb as that, Ed, I know. If Williams told you of a better job tomorrow would you be sore or would you appreciate it? You know you'd jump at it. So would I. And we wouldn't be sore about it either.

"And there's another point, Ed, that I spoke to Williams about. Whenever Tom thinks of his new job and how he got it, he'll be grateful to us. Won't he think of us as a bunch of square-shooters and be a booster for the old shop? When he needs any new machines in our line whose will he think of first? This shop won't lose a cent by the deal, Ed—even though it may make it harder for me for a while."

Was Al right in telling one of his best men about a better job?

Will the benefit to the firm offset the loss of the man?

What would you do in a similar case?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

The Foreman's Main Job

WHEN one considers the reasons which influence the forming of a business organization it can be quickly realized that the aim is profit. When the executive succeeds in his ideal of profit he is also assisting the workman to make a profit for himself. In order for the executive to succeed in making profits for himself and his workers the foreman must always bear in mind the purpose of the organization.

Ed should realize that letting the office do all the worrying about profits is giving the office a raw deal. To make the most profit the whole team must work in unison, each man pulling his own oar in co-operation with the other members of the crew. There is no limit, generally speaking, to the extent of the influence of the foreman on profits.

The ideal of the foreman should be that all work that comes under his jurisdiction should be done in the smallest possible length of time and with the smallest possible waste of materials. The ultimate ideal, of course, is to do the job with no loss of time or material. The foreman will be a big influence on the success of the organization if he keeps this ideal in mind. Every idea and method that comes to his attention can be classified under one of two heads: 1. This idea is a good one and will boost profits. 2. This idea is a dud and will lose us money. He should then conscientiously adopt those ideas found profitable and abandon any which he has found to be duds. —ARTHUR COOK.

The Foreman's Main Job

UNDOUBTEDLY, profits have always been the main objective of the foreman. If he is to be successful the problem of obtaining them should always be in his mind. Different men have different ways of looking at the problem and different ways of obtaining profits but most of them have some conception of the importance of profits. The different methods of obtaining them may be likened to a certain destination, to reach which there are alternate routes and means of conveyance. You may travel at a furious pace, taking numerous risks, injuring many by the way, and leaving everyone in a state verging on nervous collapse or you may take another road that travels more leisurely.

The suggestion made by Ed that the office should do all the worrying about profits cannot be upheld so long as the main object of the firm is to obtain them. No one engages a chauffeur and then takes upon himself all the risks and responsibilities of controlling the car and reaching the destination desired. The chauffeur who does not assume the responsibility is going to lose his job. How far the foreman can influence the profits in his department depends largely upon the foreman himself and the powers allowed him. His conduct can control it, however. —F. P. TERRY, *England.*

Cutting Down Spoiled Work

DEFECTIVE or spoiled work may be the result of wrong or indefinite information supplied to the operators. It may be due to inaccurate or worn out gages or defective machine tools and equipment with which operators are compelled to work. It may also be due to poor judgment or to lack of proper care being exercised by production supervisors or foremen in the assigning of jobs, and, finally, spoiled work may be the result of down-right carelessness on the part of the operators.

Whenever the engineers replace their customary attitude of aloofness toward the shopman with one of friendly interest in the latter's problems, misunderstandings and errors may be frequently rectified before considerable monetary losses are involved. Engineers as well as foremen and instructors must train themselves in the art of effectively imparting the necessary information to the operators.

Periodic inspection of gages as well as the thorough inspection of the first unit completed in every operation will do much to reduce the amount of defective work. The replacing of equipment and gages is a function of the management department. In shops or factories where the operators work under the wage incentive systems, a definite allowance should be included in the set-up time or price allowance for the first piece to be machined or worked upon, to compensate for the loss of time required to get it properly inspected.

Too many inspectors are imbued with the idea that their sole duty consists in finding defective or spoiled work. They are content to function as a sort of post mortem tribunal and measure their value to the shop organization by the number of scrap tags they issue. The most effective inspection department is one that is organized to co-operate whole-heartedly with the foreman to prevent defective or spoiled work. Then no foreman will have cause to suspect that the inspectors are "down on him."

Another cause of spoiled work is the result of poor judgment used in the assigning of jobs. Too many foremen and production supervisors commit the error of assigning the so-called "cream" jobs to the "old guard" in the department and the short-order jobs

THE : NEXT : TOPIC

Getting to the Big Boss

QUESTIONS

Is there any workable plan for men to get grievances past the foremen?

Or the foremen past the super?

Can foremen be fair enough not to resent a grievance, real or fancied, being told to the man above them?

which require frequent set-up changes to the new and inexperienced operators.

An exhibition of spoiled work should not only give the monetary loss of each exhibit but should likewise occasionally state the number of days or weeks that certain shipments are delayed on account of the time required to replace the spoiled parts. The pilloring of operators by labeling the spoiled work with the names of the responsible parties would cause considerable resentment on the part of the men. The purpose of the exhibition should be to tactfully induce the consideration of the men. —G. A. BAESLACK, *Supervisor.*

The Foreman's Main Job

THE big thing in foremanship, I believe, is to arouse and hold the mechanic's keen interest in production. By keen interest I mean the same kind of interest that the workman would display in pitching a ball game or in shooting a game of pool, if those are his favorite diversions. This interest, of course, is a matter of knowing the objective and in production it is a matter of education. If he can put this spirit into his men the foreman is a leader and not merely a boss.

When it comes to assuring profits, this is fundamentally the function of the cost department rather than that of the foreman. Selling costs, material costs and financing are beyond the scope of the foreman. He has done his share when he gets the most possible out of his department. The cost department, however, can reduce the profit problems to terms of production required in order to make a profit. The foreman can then know where he stands and assume the full responability for meeting his quota. —JOHN L. STARR.

Keeping Men Interested in the Job

AL'S IDEA of telling each man the story of the piece should be a great help in keeping the men interested in their work. Most men will take more pride in their work and try to do a better job when they know how it is to be used to make the finished product and where the finished product is to go.

Ed seems to take a pessimistic view of things. While there are men of the type who looks only for his pay envelope, the vast majority of men in industry take more or less pride in their work. If Ed would only look back to the days of the World War, when posters, graphic charts and percentage scales were so successful in keeping up the enthusiasm of the people, he would see the logic of Al's viewpoint.

—THOMAS M. GARRY, *Foreman.*

Saving a Man's Face

THE majority of men who are now foremen can well remember the time when they got called down before their shopmates and were made to feel small so that their bosses could expand their chests and feel glorified. It was the natural course of events in those days because we were not supposed to know much. But did the foremen know it all? In those days a foreman was a driver of men rather than a teacher and a leader. His success depended on his capacity for instilling a respectable amount of fear in the souls of his men.

Thanks to more enlightened views on human relations today, we realize, like Al, that every act has a reaction and that you cannot hurt a man's feelings without getting a reaction back on yourself. The principle that we apply today in the shop when a machine lays down is to find the cause and not to "cuss" it, then to apply the remedy. This same principle must be applied to the conduct of men.

When domestic troubles influence a man's conduct of himself it is the foreman's job to know it and to be of as much assistance as possible. Employees are human beings and are highly susceptible to their surroundings. To publicly call down a man whose faults can be attributed to causes outside of the shop and outside of his immediate control certainly would hurt his feelings, aggrevate the situation instead of clear it up and would probably make him feel revengeful. Every man has good traits and they can and should be found by the foreman. When they have been determined, the rest is simple. —C. L. HENRY, *Foreman, England.*

The Foreman's Main Job

AL IS right. One of the most important things a foreman has to look after is to have his department in such a condition that all his men will feel at home in the place. The work will go much smoother if this is the case. It will not do any harm for the foreman to preach a little to his men about profit. It is a bad policy for the foreman to go from man to man trying to speed up work for it frequently will make him excited and cause mistakes in the job. On the other hand, if the foreman can tell the men how much this and that machine cost and can start them to thinking about profits he will succeed in speeding up the work in the shop.

Not only the management and the foreman, but also everyone else in the shop should worry about profits. The shop must build up a reserve during prosperous times so that it will be prepared for the rainy day. If the shop is not prepared for depressions it will mean the immediate laying off of men. No factory executive likes to have to lay off men that have been faithful to him for a long period of time, but only profits can prevent this necessary measure.

—B. RIVEDAHL, *Foreman.*

Keeping Men Interested in the Job

IT IS very difficult for us to concentrate our minds on anything that is not interesting. When we are so engaged we are apt to find our minds dwelling on some other matter that does hold our interest while our hands are performing the less interesting job in a more or less careless and routine way in spite of a sense of justice to the job and to the employer.

A workman is encouraged to do better work by being informed of the cost and seriousness of defective workmanship. To enable him to understand this fully it is best for him to know the machine for which he is making the part and the particular functioning of the part in that machine.

An oil groove improperly cut might cause a gear to

seize on its bearing. If the workman knew that when he was cutting the oil groove any error on his part might ruin a whole train of expensive gears and put the machine out of commission he would be sufficiently impressed to increase the quality of his work. He should also be made to know the reliability that he is helping to build into the machine as well as the reputation that he is making for himself as a trusted workman.

—JOHN MARK MAY.

Keeping Men Interested in the Job

AL'S IDEA of letting men know where the work they do is to be used will keep the men more interested in their work and will encourage them to talk more about their jobs than against them. It will also give the foreman a chance to show the men why a high standard of quality must be maintained.

No doubt, the average man likes to know how and where his work is being fitted in, in relation to the other work, but he is most interested in quitting time and pay day. From what I have observed, the one thing that keeps men interested in their work is an incentive plan whereby the harder they work the more pay they will receive.

The bulletin board is not used in our shop but we have a factory newspaper printed twice a month. This paper carries much news as to where and how our work is being used. The paper is interesting and renders a real service. —JOS. E. ABBAZIA, *Mech. Instr.*

Keeping Machines Oiled

IN THE shop where I was an apprentice, one of the most important jobs of the embryo machinist was to oil the machines and all other equipment with bearings. As to whom this job should fall upon is dependent on circumstances. In the small or repair shop it may fall on the machinist.

In the manufacturing shop where specialization is the dominant factor there is a man who is responsible for the line shaft bearings and one who is responsible for all other bearings. In each case he is apt to have assistants, either apprentices or unskilled men. In my estimation this is the proper method, there should be a man responsible for the oiling and his assistants should be apprentices who are being trained to become machine operators. —BENJ. C. THOMAS.

Getting Men to Observe Safety Rules

NATURALLY, the foreman is responsible when an accident occurs in his shop. The foreman must insist that safety rules be obeyed. The safety department should co-operate with the foreman in making safety rules easy, pleasant and wise to observe.

Al and Ed can reduce accidents by going to the root of the matter and studying the causes of accidents in their departments. Shop conditions should be discussed with safety department officials. Safety appliances should be requested when the need is seen. Careless men should not be assigned to dangerous work. The men should be "sold" on the idea that safety rules prevent human suffering. —R. SENAY.

Who Should Keep Machines Oiled?

WELL, Ben, who has been stepping on your toes?" asked the works manager.

"Toes h——," Ben replied. "I'm through, positively."

We had heard similar talk before from Ben, our master mechanic, but not quite so much in earnest. It seems that Ben fixed up a turret lathe a few days before and that afternoon it broke down again. It was the old, old story, "No oil."

Every operator, of course, had instructions to oil his machine before starting the day's work but the operators are on piece work and some of them either forget or do not want to take the time to oil. They have nothing to worry about because they are promptly put on a day rate in case of a breakdown. But the breakdowns had increased to an alarming degree and most of them were from lack of oil.

At a meeting of the foremen and executives Ben insisted on firing every man found guilty of neglect. The foremen, of course, were opposed to this because they would rather have a negligent experienced hand than any kind of a green one. The idea of hiring a special oiler did not seem advisable because all oiling had to be done on overtime and there was nothing else for the man to do.

The plant engineer then made his suggestion. The machine shop was to be divided into groups of six men each. Each group was to choose a captain whose duty it was to see that each man oiled his machine daily and also to notify the foreman when any machine seemed to show signs of coming trouble. The different groups were posted on a scoreboard and the scores kept. The group that made the highest score was given a bonus of six dollars from the firm as an appreciation. The suggestion was adopted and Ben, the master mechanic, has almost forgotten how to swear.

—MORTON W. WALTERS, *Designing Engineer.*

Personal Appearance in the Shop

WITHOUT doubt, Ed is on the right track in order to accomplish the object which he has in mind. There is something considerably more than a "white collar" behind his ideas on cleanliness. Cleanliness creates a subtle but definitely improving influence in the shop, that cannot do other than work for the good of both the men and the firm. I have always held to the belief that a man turns out better work if he keeps himself and his tools clean. He will have more pride in himself and his work.

I recall not so long ago that it was necessary to bring in some die makers from the outside. These men came to work with kid gloves on their hands and exercised the greatest care of their clothes. They would walk from one side of the shop to the other to avoid spitting on the floor. They wore white collars all the time and kept their tools accordingly. In a short time our own men began to come to work better dressed and to wear white aprons and white collars. It was a fine condition. Cleanliness pays big dividends. Clean clothes and clean thoughts have an ever widening influence in the minds of the community in regard to the firm and the men there employed. —ARTHUR MUMPER, *Foreman.*

Ideas from Practical Men

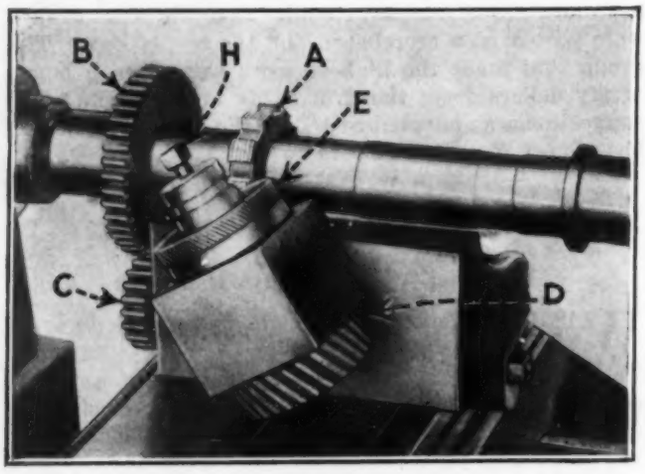
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

A Hobbing Device for Knurling

By E. V. Allen

On a cam-operating disk 3½ in. in diameter, it is necessary to knurl the periphery in order to afford a good hand hold. Ordinary knurling didn't go deep enough and proved unsatisfactory in other ways, so it was decided to try hobbing. After a little scheming, the device shown was made. It has been in use for about two years, in which time probably 5,000 pieces have been knurled by it.

The work is done on a regular plain milling machine. The cutter *A* is an ordinary 4-pitch tap hob. On the arbor with the hob is the gear *B*, meshing with the gear *C*, on the fixture. This latter gear is on the same shaft with a helical gear meshing with the helical gear *D*, attached to the lower end of the work spindle. The



A hobbing device for knurling

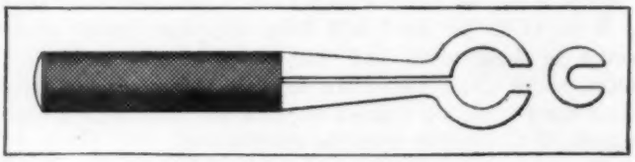
disk to be knurled, is placed at *E*, and is held by means of the capscrew *H*, which is shown only partly screwed into the work spindle.

Since gear *C* on the fixture is directly under gear *B*, on the arbor when in working position, the milling machine table can be run back easily when loading or unloading.

A Magnetic Clip-Holder

By August H. Wild

The device shown in the illustration was made for removing and replacing the clips generally used under the washers of valve springs in automobile engines, after the springs have been compressed.



Magnetic clip holder

It is made of magnet steel, forged to the shape shown, and is magnetized while at a red heat.

By use of the device, the clips can not only be removed and inserted but its magnetic properties keep them from falling during the process. The magnetism is strong enough to pull out and hold the spring-retaining pins in the valve stems of Ford engines.

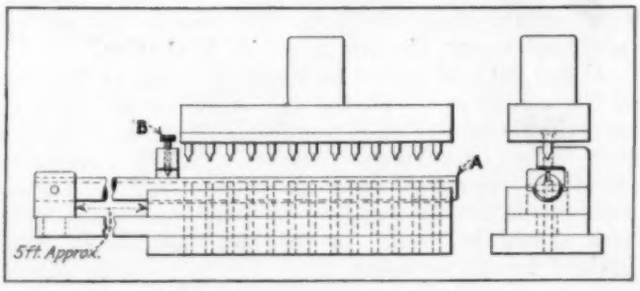
A Set of Unusual Press Tools

By Charles M. Otis

The press tools illustrated are for punching a row of 0.052-in. holes in tubing. The tubes are about 120 in. long and contain 154 holes on ¾-in. centers. A tube is placed on the rod *A*, and rests in a half-round groove in the die shoe. In this position a row of holes is punched. There are no individual dies for the punches and it is remarkable how clean the holes are punched.

To accommodate the burr thrown up on the inside of the tube, a rectangular groove of the same width as the diameter of the punches is planed in the top of the rod. Clearance holes drilled from the bottom of the rod and extending into the rectangular groove, allow any punchings to fall through.

Starting at one end of the tube, a row of holes is punched at one stroke of the press. Then the tube is pushed along the rod, to the left, until the hole at the right-hand end of the row comes under the index pin *B*, which provides for spacing the rows of holes and also locates the tube so that the holes will be in a line. With the index pin engaging the hole, the press is tripped and another row of holes is punched. This



Multiple punches for tubing

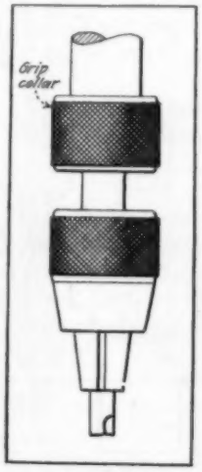
process is repeated until holes have been punched to the middle of the tube, when it is withdrawn and the opposite end is placed on the rod, and the former operations are repeated.

Tools were made for ½- and 1-in. O. D. tubing, the thickness of which, in both cases, is 1/16 in. Both steel and aluminum tubes were punched. After punching one row of holes, it was sometimes necessary to hit the tube on the end with a mallet in order to loosen it from the rod, after which it could easily be moved back and forth by hand.

Suggestion for Sensitive Drill Presses

By J. Homewood

Builders of sensitive drill presses do not seem to have made any provision for holding the spindle stationary while the operator tightens the drill chuck. Of course, where a key chuck is used, such provision is not necessary. However, the operation of many drill chucks depends upon hand rotation of a knurled sleeve, and it is when using such chucks that provision should be made for holding the spindle stationary. The usual practice is for the operator to reach up and grab the spindle pulley, or else to put the drift key through the spindle slot and use it as a hold back. In order to facilitate matters, I would recommend that a knurled collar be shrunk on the spindle just above the chuck, as shown in the illustration. Such a collar would enable the operator to hold the spindle stationary with one hand while he tightened or loosened the grip of the chuck with the other. The diameter of the collar should be at least as great as the knurled part of the chuck, thus allowing the operator to exert equal amounts of turning and holding force. An arrangement of this kind would be a boon to the operators of sensitive drill presses, and would be the means of saving them considerable time, especially if they were on piece work.



Knurled collar to hold spindle from turning

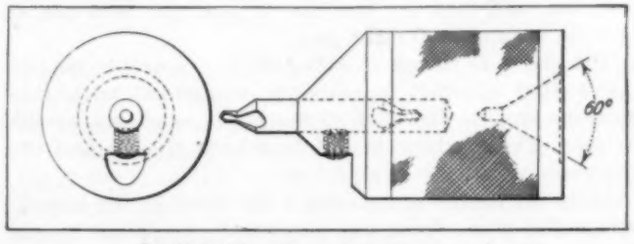
A Centering Tool

By Robert W. Haggar
Ontario, Canada

The holder for a combination drill and countersink, illustrated, is for use in the centering of work such as cold-rolled steel, where any finish by turning is to be concentric with the original stock. Such work is chucked at one end and the other end is held in the steadyrest of the lathe during the operation.

The device is placed upon the tailstock center, and is held in the left hand, the knurled surface providing a good grip. The drill is fed to the work by advancing the tailstock spindle in the usual manner.

The body of the device is made of cold-rolled steel and is drilled and reamed to suit the combination drill and countersink, which is held by the setscrew as shown.



Drill holder for centering work

Strap Iron Defines Aisles

By John Madden

By defining aisles with strap iron nailed to the floor, as shown in the accompanying illustration, sections between pits in a locomotive repair shop are provided for the storage parts to be assembled to the locomotives and for other materials. The arrangement leaves a clear aisle on each side of the storage section for the passage of trucks and men.

For some of the work scaffolds must be erected against the locomotives. When it is necessary to erect them in the aisles, the fact that parts are stored in the center section makes unnecessary the moving of quantities of heavy materials to find a place for the feet of the scaffold. Ordinarily the scaffold can be built with its platform high enough that trucks and men will have passage room underneath.

Aisles between pits marked by strap iron nailed to the floor

The arrangement illustrated is in use in the Pocatello, Idaho, shops of the Union Pacific System.

Jig for Drilling Equally-Spaced Holes

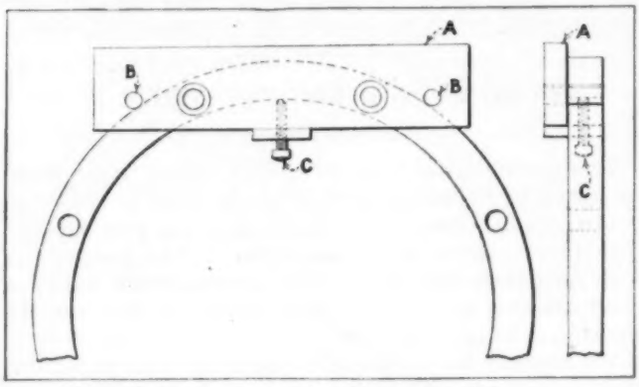
By Chas. Kugler

We had the job of drilling 40 holes in a jig plate 9 ft. in diameter, as shown in the sketch. While extreme accuracy was not required, since the jig was to be used only for drilling bolt holes, the method used proved to be entirely satisfactory. It also saved considerable time over the usual procedure of laying out the jig plate for the holes and using a wiggler to bring the centerpunch marks in alignment with the drill spindle.

The master plate *A* was carefully laid out and bored, the distance between the holes being equal to the chordal distance between the holes to be drilled in the jig plate. The master plate was fitted with slip bushings, one for

drilling and one for reaming. Pins at *B* located the master plate so that the holes to be drilled would be in the proper radial position. The setscrew *C* was used to bring the locating pins in contact with the outer diameter of the jig plate.

After drilling and reaming the first hole, a close fitting plug was put in, holding the master plate in position for drilling the next hole. The process was repeated, stepping the master plate from hole to hole until all the drilling and reaming had been completed. To complete the jig plate, it was necessary only to fit the holes with hardened bushings.

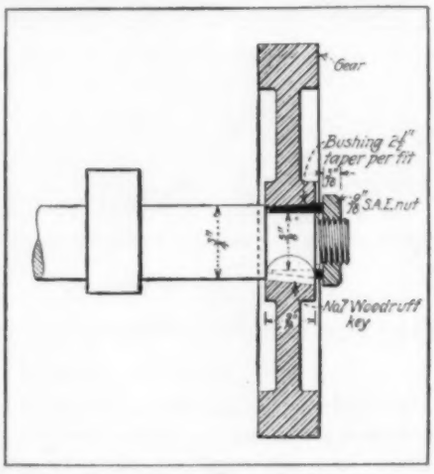


Master plate for drilling a jig

Securing a Gear on a Shaft

BY GEORGE WILSON

In the sketch herewith is shown a method of holding a gear on a shaft in a place where space is very limited and the service severe. The requirements are that the gear shall go on the shaft to a certain distance within very close limits, that it shall be easily removable and that all parts shall be interchangeable. The gear is within the crankcase of a gasoline engine, the crank of which swings so close to the end of the shaft that a nut larger than the one here shown cannot be used. A shaft tapered at the end was first tried, but it was found impracticable to make the parts interchangeable and a gear would go on some shafts farther than on others, no matter how accurately the parts were made. This device consists of a tapered bushing, fitting a tapered hole in the gear and drawn up with a nut. The gear abuts against a shoulder on the shaft to locate it. The bushing is cut through one side to accommodate a Woodruff key. The shaft is hardened and ground; all the other parts are soft.



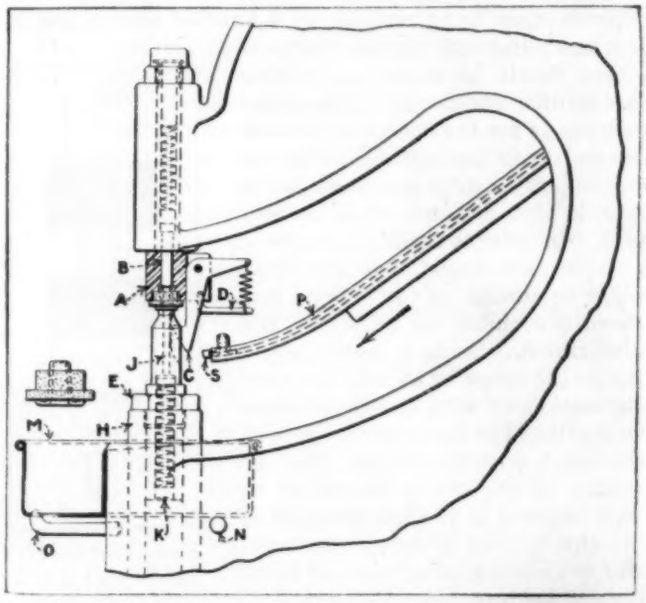
Section through gear, showing method of holding

Standard Eyeleting Machine Assembles Electrical Part

BY J. E. FENNO

The eyeleting machine illustrated was adapted to assemble two fibre washers and an eyelet used as part of an electric switch. In the old hand method, the pieces were assembled over a pin inserted in a steel block, and the eyelet was turned over by means of a steel tool fitted with a wooden handle. With this hand method, approximately 100 pieces per hour per operator could be completed, while with the machine method to be described, 400 to 500 pieces per hr. could be assembled by a single operator.

Referring to the drawing: *A* is an anvil attached to the head of the machine. It is bored to receive the sliding plunger *B*, which is backed up by a coil spring and a filler pin. The stripper lever *C* is pivoted in a lug on the anvil and the end of the lever is provided with a very light spring suspended from the post *D*, which is screwed into the anvil. The end of the anvil is counterbored to receive the fibre washer with plenty of clearance around the periphery.



Eyeleting machine used to assemble washers and eyelet

The bottom anvil *E* is screwed into the sliding member *H* of the machine and is bored to receive the plunger *J*, which is backed up by a coil spring and the screw *K*. A slot is cut in the lower anvil to provide clearance in which the stripper lever *C* operates.

The pan *M* is made in such a way as to be easily detachable for the purpose of emptying the assembled parts. It should be noted that the center of the pan is cored out in a horseshoe shape to fit the contour of the machine, and that the two pins *N* and the bent pin *O* provide a support for the pan.

The chute *P*, which is attached to a movable hopper above (not shown), is standard equipment with this machine and its direction of motion is as shown by the arrow. The machine is operated by a treadle and the sequence of motion is as follows:

Upon the downward stroke of the anvil *E*, the lever *C* strips the work from the plunger *J*, dropping it into the pan *M*. On the continuation of the down stroke and

near the bottom, chute *P* moves down and in, thus placing the first eyelet in the chute directly over the plunger *J*. As the anvil *E* starts to ascend, the plunger *J* spears the eyelet, and, as it continues upward, the chute moves back out of the way to its original position. At this point the operator stops the motion of the machine and with one hand slips the large fibre washer over the eyelet and with the other hand pushes the thick washer on as far as possible, as this latter washer is designed for a tight fit. The operator then continues the motion of the machine, and the eyelet and washer pass the angular end of the trip lever *C* and go up into the counterbored end of the anvil *A*, where they are assembled. A stop is provided under the machine to prevent crushing the work in the anvil. The stroke of the machine is 1¾ in. The spring stop *S* holds the line of eyelets back in the chute.

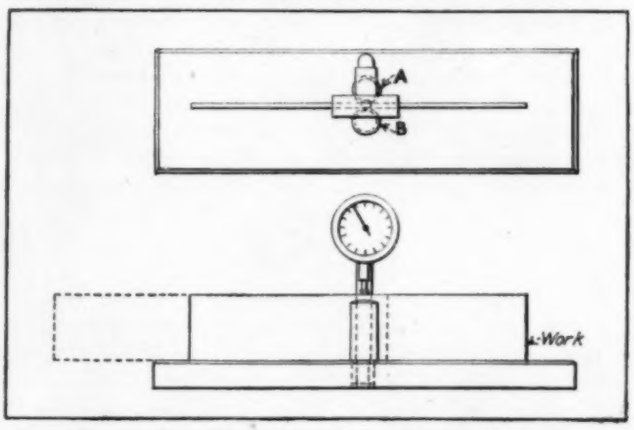
Gage for Testing Parallelism of Blades

By Henry Simon
Jena, Germany

A gage used in the inspection of thin blades, such as go into squares, and which commends itself for its simplicity as well as its dependability and rapid work, is shown in the illustration.

The gage consists of a base made of a plate of tool steel, hardened, ground and polished on its upper surface, upon which a dial indicator is mounted so as to bring the contact point about its center. In front of the rod upon which the dial is mounted and equidistant from the indicator point, two hardened tool steel pins *A* and *B* are located. The pins are of a height slightly less than the width of the blades to be tested, and are of such proportions will cause them to be separated by a few thousandths more than the thickness of the work.

In operation, the blades are simply pushed between the two uprights and slid along by hand. Any portion of the edges can in this manner be examined. While mainly intended to test the parallelism, the gage will also reveal other defects in the edge, such as lack of straightness. If these troubles are to be tested for



Gage for testing the edges of thin blades

regularity, the base block should be twice as long as the work in order to give a true picture of the state of the upper edge when the lower edge happens to be concave.

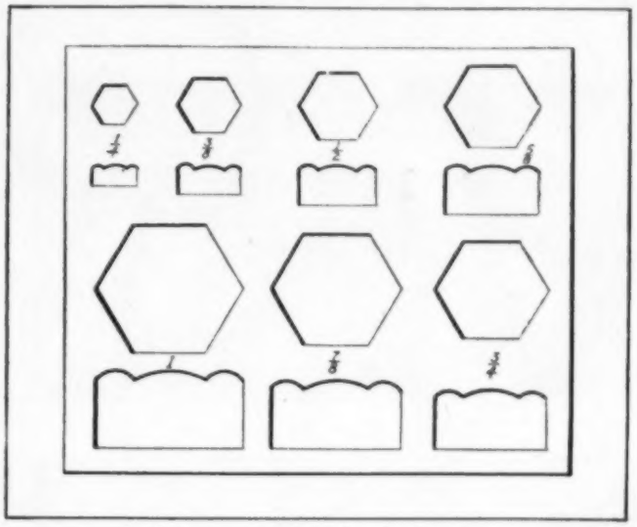
A particular advantage of the gage is that it does not require the work to be handled with any special delicacy. Anyway the blade can be pulled through between the upright pins is also good enough to show its condition. Very rapid testing is possible in this way.

A Draftsman's Time Saver

By P. H. White

The device shown in the sketch can be easily made by any draftsman and will prove its worth many times over in making layout drawings.

The material is transparent celluloid about one thirty second of an inch in thickness. On the surface is



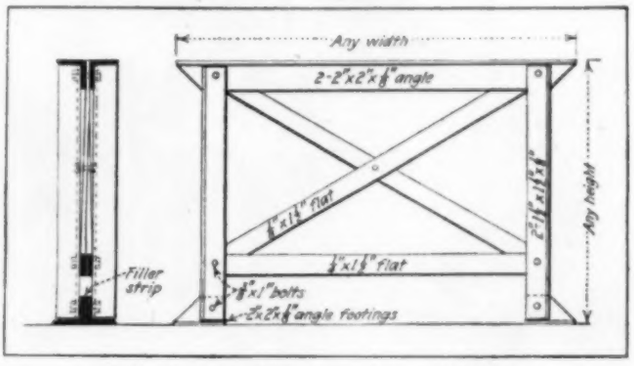
Nut templet for the draftsman

scratched the full size plan and side elevation of the most frequently used standard nuts. The inner portions are then cut away, thus leaving openings in the piece, which form a guide for the pencil when making a bolt head or nut on a drawing.

A Standard Bench Leg

By Fred Fisher

It is often necessary to make benches of varying width and height, and I have used with success the bench leg shown in the illustration. It can be made any width or any height by varying the lengths of the angles and flats to meet conditions. Only six bolts are actually required for assembling a bench leg. The angles and flats are cut to the lengths desired and are punched or drilled with $\frac{7}{16}$-in. holes, after which it is a



Bench leg built of angles and flats

simple matter to assemble the leg. I find that these legs cost less for material and labor than the bench legs on the market, and at the same time the advantage gained is that they can be made to meet any height or width.

A Drawbar Shortener

By John Madden

A drawbar shortener in use in the Las Vegas, Nev., shops of the Union Pacific System is illustrated in Fig. 1. The essential dimensions are shown in the halftone.

The drawbar to be shortened is heated at the point where upsetting is desired and is then bent by means of a chain block while it is held in the steam hammer as shown in Fig. 2. The final step is to place the bar into

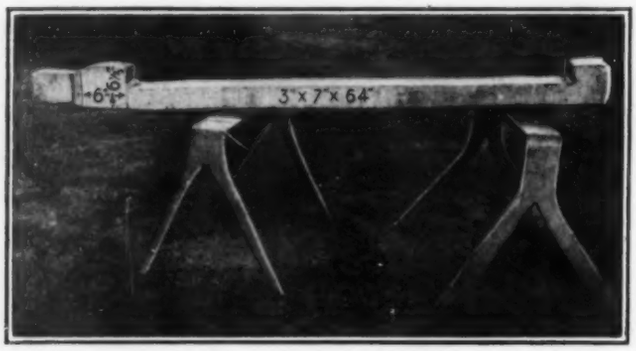


Fig. 1—Drawbar shortener

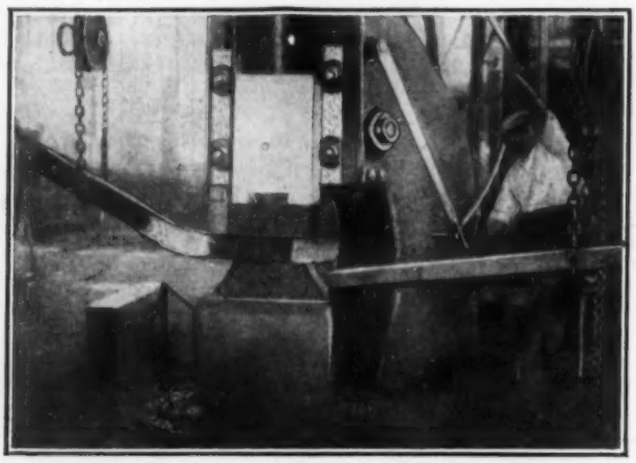


Fig. 2—Bending the drawbar before shortening

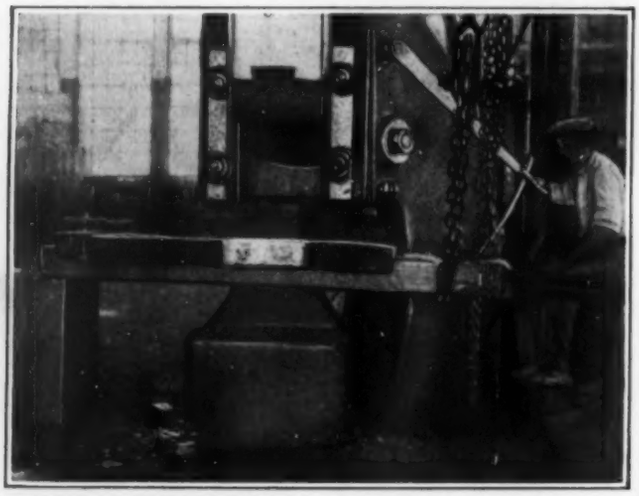


Fig. 3—The drawbar just after being shortened

the shortener with the bend up, and to hammer it out straight as shown in Fig. 3. It will be noticed that the shortener provides for some variation in length of the shortened bar, blocks and strips being used between the end of the bar and the jaw of the shortener.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

Seasoning Iron Castings

Q. Can you advise us as to the process of seasoning iron castings? What benefits can be expected from seasoning cast iron?

A. The simplest method of seasoning cast iron consists in storing the castings for a period of several months. The internal strains in the castings are gradually relieved, and they thus acquire increased strength. The disadvantage of this method, however, is that it usually ties up a heavy stock, which is not only costly by adding to the overhead, but does not permit the quick introduction of improvements in design.

Another method of seasoning is by slow heating and cooling. Several such treatments may be given with advantage, but care should be taken not to bring the temperature above a red heat, since gray iron will take a permanent "growth," or increase in size, in heating.

Slow tumbling, so that the castings will receive slight blows frequently repeated, will also relieve the internal strains. It is claimed that half an hour of proper tumbling is equivalent to six months of ordinary seasoning.

The relief of the internal strains in castings is of such importance that some seasoning is almost always necessary. Care should always be exercised in scheduling work so that castings that enter into the construction of machines or important parts will not be rushed from the foundry to the shop.

Pickling Iron Castings

Q. We have been using sulphuric acid pickle for castings, but I am told that hydrofluoric acid will give better results. What is the action of the latter acid?

A. The sulphuric acid solution acts upon the iron, eating it away from under the sand and leaving it free to drop off. Hydrofluoric acid, on the other hand, dissolves the sand, and does not affect the iron perceptibly. The action of hydrofluoric acid is more rapid, and less acid is required. The strength of the pickle is about 5 per cent solution, and will give good results when cold.

Cleaning Brass Parts

Q. In the drawing of an intricate brass part we use two annealing operations. We expect to assemble these parts without plating. What pickle would you suggest to remove the black stained color?

A. The black color is due to an oxide, or scale, formed in the heating. A pickle that will restore the yellow color can be made of a solution of 1 part of sulphuric acid to 10 parts of water. The pickling operation is very rapid and the parts should then be immediately washed and dried. A richer color can be given to the brass parts by employing a second pickling bath of a weak solution of nitric acid, or nitric with nitrous acid. A weak potash solution should be used for washing. To retain the yellow brass color of the parts without plating you should dip them in laquer before assembling.

Machine Clamping Methods

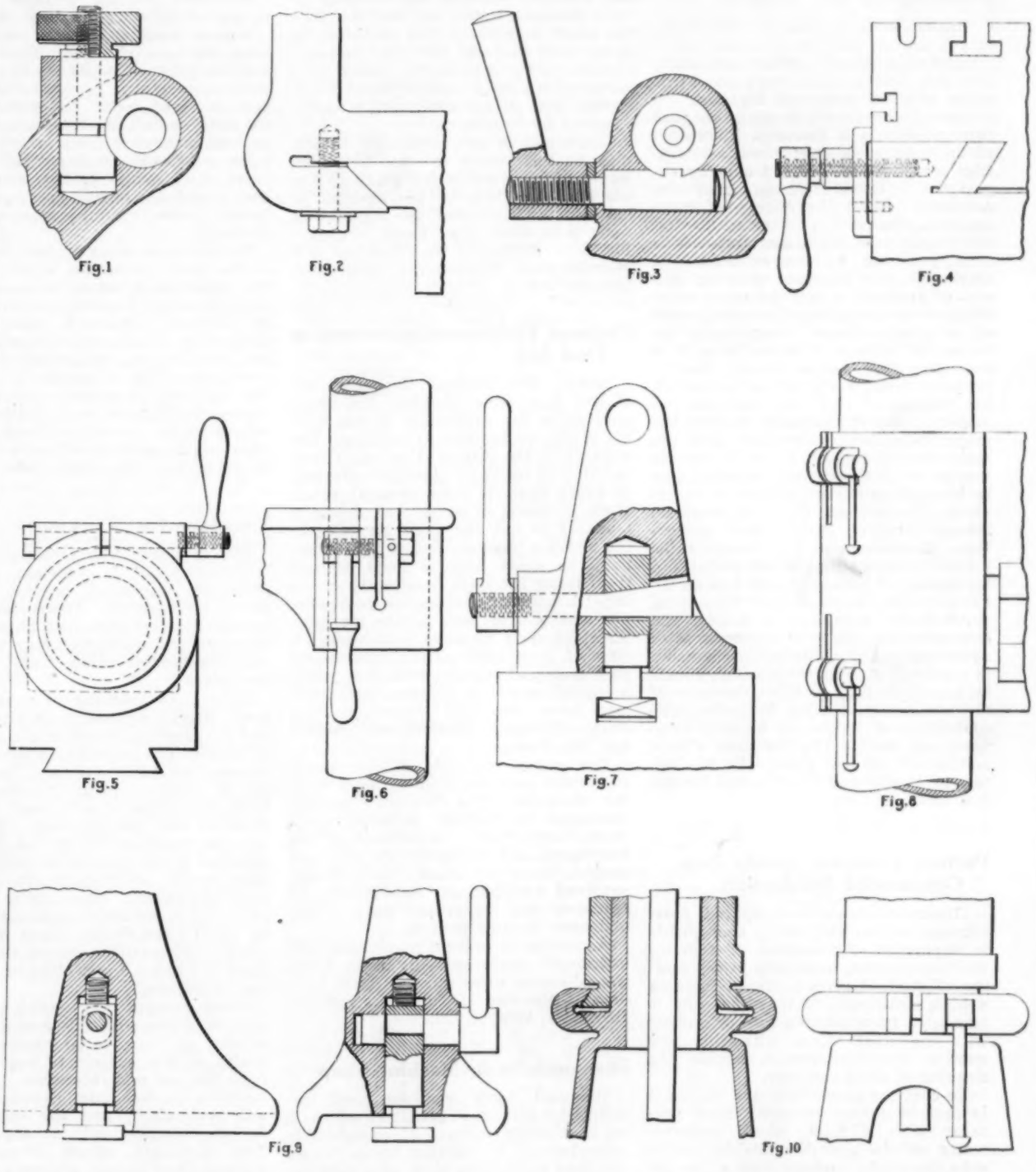


Fig. 1—Clamping with bolt and bushing. Fig. 2—Clamping by spring dovetail. Fig. 3—Spindle clamping bolt. Fig. 4—Clamping sliding table with plate and bolt. Fig. 5—Clamping a spindle with a split bracket. Fig. 6—Sleeve split at ends for clamping. Fig. 7—Example of wedge clamping. Fig. 8—Clamping with a split bracket. Fig. 9—Clamping with an eccentric. Fig. 10—Clamping a swiveling column.

Contributed by Edward T. Heard

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Technical Abstracts

Foremanship as a Science

Foremanship is rapidly developing into a science and the foreman into a scientifically-trained minor executive. For this reason more study should be given to the selection of foremen.

One of the first essentials of good foremanship is a thorough knowledge of the work to be supervised, a knowledge that can be obtained only by experience. Other phases may be acquired: Since the science of management enters, it is paramount that the foreman be made acquainted with such problems as the economics of marketing, the elements entering into cost of production, and the many other elements entering into the management of a plant. Since foremanship involves the science of supervision, it is necessary that he be taught how to properly treat his working personnel, his machines, and his materials in process. His duties also include the proper selection of workers and the regulation of wages. There is only one way in which the average foreman may be brought to a high degree of supervisory efficiency and that is through an intensive course in practical instruction. Foremanship also involves the science of teaching, which includes a knowledge of pedagogy and human behavior, a knowledge of habit formation, psychomotor reactions, a telling and demonstrating, such as a schoolmaster never met with. Finally, foremanship is a science of leadership which should be manifested by abilities, honesty of motives, square dealing, initiative, self-control, good judgment, loyalty, firmness, and tact. The foreman should neither coerce nor plead. B. H. Van Oot, in *Mechanical Engineering*, December, 1926, p. 1404.

Putting Titanium Nitride Into Commercial Production

Titanium nitride is prepared from nitrogen of the air. When this nitride is applied to the surface of foundry molds and cores, especially in the casting of steel, it gives to those surfaces a high resistance, so that the sand is prevented from burning into or uniting with the steel. Thus with this new powder the foundryman avoids the cleaning of small castings.

To coat the molds with the nitride it is first necessary to spray their surfaces with a fairly thick molasses water and to blow the nitride powder onto the sticky surface with a fair degree of force. The ordinary dusting with a bag, as is done with silica flour and other facings, is useless. Very little nitride is required but the nitride facing must be uniform and must completely cover the surface of the mold. When making a small casting a surface a hundredth of an inch in thickness is sufficient. With larger castings and cores the material may be made up with molasses water and swabbed onto the sand. Sometimes it is necessary to apply more than one coat. The castings obtained from a properly coated mold have, when cold, a smooth bluish black surface and all adhering sand is easily removed by brushing.

Gears and other complicated shapes may be cast closer to size, for much less machine work is necessary to finish them and due to the absence of burnt-in sand particles, the machinist's tools hold their edge much longer.—Foord v. Bichowsky in *Chemical and Metallurgical Engineering*, December, 1926, p. 750.

Pullman Employees Instructed in First Aid

Nearly 600 Pullman Company employees have either received Red Cross certificates for graduation in the first aid course, or are now in training. The purpose of the course is to teach men to think in terms of physical suffering, to cause them to view unusual situations in terms of safety, to create a tendency to put one's self mentally in the victim's position, and to induce the pupil to study how to keep himself from being involved in an accident; to impel a man to analyze his particular job, and to urge men to take more interest in their physical well-being. A class of twenty-five safety supervisors, yard men and porters were first given a special course in Chicago, and these men later organized classes in New York, Chicago, Washington, Buffalo and San Francisco.

The course requires fifteen hours' time from each pupil, or 1½ hr. a week for ten weeks. The Pullman Company furnishes instructors, material, textbooks, etc., free. Technicalities are eliminated and fundamentals only are taught, such as shock, hemorrhage, artificial respiration, mobilization of fractures and the proper ways to lift and carry injured persons.

According to present plans some 600 additional employees will begin a 10-weeks' course after the Christmas holidays.—*Railway Mechanical Engineer*, December, 1926, p. 777.

Diamonds in the Machine Shop

Diamond tools can be used indefinitely without regrinding, which is an economical feature of considerable importance. In turning brass tubing diamond tools have been used continuously for eighteen months without regrinding. One of the secrets in the successful use of diamond tools for metal cutting is that the work must revolve before the diamond is brought into contact with it; otherwise the sudden impact in starting the work is likely to break off the cutting edge. When the work is revolving, however, intermittent cuts can be taken without danger of injuring the diamond.

Metals machined on a production basis are brass, bronze, aluminum and german silver, but diamonds are also used successfully in machining steel and cast iron parts. In operations on the latter metals the feeds are as great as, and sometimes even greater than, those ordinarily employed with high-speed steel tools. It has been found that sand-holes in iron castings do not damage the cutting edge of the diamond.

Brown Brazilian or African diamonds of the same properties as gems, with the exception of the color, are used for metal cutting. Experiments with black, or "carbon," diamonds have shown them to be satisfactory for cutting rubber, bakelite, etc., but unsuited for the precision cutting of metal. It is essential that the diamonds used for this purpose be of close grain and free from carbon spots, so that a keen cutting edge may be ground.—Charles O. Herb, in *Machinery*, December, 1926, p. 241.

Vacations for Workmen

The employer who contemplates the introduction of a vacation plan is primarily interested in the way it affects his business. There seems to be considerable evidence that absenteeism, turnover, and production may be favorably affected by certain kinds of vacation plans.

Where the granting of vacations is made directly dependent on attendance, and the vacation is sufficiently generous to furnish an incentive, a decrease in absenteeism has resulted. The majority of vacation plans provide that a term of service of one year or more precedes the first vacation. This lessens the turnover, but the length of the vacation granted must be sufficient to seem worth waiting for in order to have any effect. Two days at the end of a year is not apt to reduce turnover. In the United States, plant managers almost universally reported that vacations had had a direct effect on increasing production.

Wage earners who receive vacations acquire increased self-respect by the raising of their social status. Their health is also subject to improvement from the rest and recreation. An ideal vacation involves quiet, change of scene and occupation, and the opportunity for the whole family to share in it. The unassisted efforts of individual workmen can seldom achieve a vacation of this kind. It is here that the companies, groups of workmen, or government labor departments can play a helpful part.

Many owners and executives are not convinced that vacations with pay have sufficient value to warrant their cost. Opposition to vacation plans, however, is more likely to come from those em-

ployers who have not instituted a plan, than from those who have.—Industrial Relations Counsellors, Inc., in *Manufacturing Industries*, December, 1926, p. 449.

The Economy of Processing Fuels

So far it does not appear that the processing of coal is going to provide a power-plant fuel which will permit any marked economies in combustion efficiency, steam plant investment, maintenance or operating expense. Therefore the determination of whether power plants shall process their fuels for byproducts is a combined economic and organization problem. Before any processing is done by them on an extensive scale they will investigate the extent and stability of the market for the byproducts considered. Will the revenue from the byproducts carry a large enough percentage of the fixed and operating charges, including commercial expense of disposal, to enable the power-plant fuel to be obtained at a sufficiently reduced expense? Is the increased complexity of organization warranted by the net profit obtained?

If processing of all coal used by utilities and power plants becomes more economical from a production and revenue viewpoint, it might be conceived desirable some day to have all processing in one locality done by one organization which would dispose of gas to the gas-distributing company and power-plant fuel, or possibly electrical energy, to the electric service company, and so on.—*Electrical World*, Dec. 25, p. 1308.

First Year of Norton Company's Credit Union

The Norton Credit Union, founded a year ago, now has 800 member shareholders, consisting of employees of the Norton Co., Worcester, Mass. The union has made over 500 loans to more than 300 individual borrowers, totaling $60,000. Under the by-laws money is loaned only for actual need.

The credit union is protected by the laws covering Massachusetts Mutual Savings Bank loans. Investments are carefully prescribed. A carrying fund must be maintained. No loan may exceed five per cent of the total assets. Membership is confined to particular groups by the law. Hence, the Norton Credit Union must restrict its membership to employees of the company. To become a member an employee must subscribe for at least one share of stock at $5 par value. Loans are obtained by application to a credit committee. Loans not over $100 are given on a personal note. Amounts above $100 and less than $300 require endorsement.

Many of the loans made have been to help in home building. The largest element of membership consists of men with families. The Norton Co. exercises no control over the credit union. It furnishes office space and a clerk. The members do their business with the credit union just as they do with a bank. Officers are elected and all policies determined by the stockholders and board of directors.—*Iron Age*, December 23, 1926, p. 1760.

Electro-Sherardizing

Electro-sherardizing consists in covering iron or steel with a protective coating by revolving in drums in a zinc dust preparation, which is maintained at a temperature of from 700 to 750 deg. F. by means of electric heat.

The material to be sherardized must have a clean surface free from scale, rust spots, or oils. The cleaning can be accomplished by sand blasting or pickling. The pickling solution consists of one part of sulphuric acid to 12 parts of water. If a very smooth finish is desired the solution should consist of 1 gal. of sulphuric acid, 30 gal. water, and ½ gal. muriatic acid.

Before good sherardizing results can be obtained it is necessary to run several heats, using scrap material so as to pulverize the zinc dust preparation until it shows a dark color. After 4 or 5 runs an analysis of the dust should show 85 to 90 per cent of metallic zinc and from 8 to 10 per cent of zinc oxide. The lead content should never be permitted to be above 1½ per cent, as the lead deposits in lumps and results in poor appearance. By adding a quantity of the original zinc dust it is possible to lower the percentage of lead.

The dust should be run through a magnetic separator at least once every two weeks in order to eliminate any iron. In packing the drum approximately 400 lb. of zinc dust should be used for 2,000 lb. of miscellaneous material such as bolts, nuts, and small pieces. After each run about 20 lb. of dust should be removed, and 20 lb. of new zinc dust should be added. The standard thickness of the zinc deposit to give the best protection is 0.0025 in. Allowances on threads or fitted parts should be made for this amount.—*The Metal Industry*, November, 1926, p. 459.

Using Non-Metallic Gear Drives to Prevent Noise

Before replacing noisy metallic gears with non-metallic ones alignment of the shaft and meshing of the teeth should be checked. The cause of noise will often be found here. For noiseless operation a material softer than iron or steel is used. Rawhide has been longest in use. Gears made from it are built up from layers of specially treated skins cemented together and bolted between end plates of metal. They should not be run with cast gears or where the motion is reciprocating or intermittent. Cold has no effect on them but they should not be run in temperatures above 200 deg. F. nor where they will be subjected to water or to a bath of oil.

More recently gears cut from built-up layers of fabric impregnated with Bakelite resinoid have come into use. They are made by several companies and sold under various trade names. The methods of manufacture differ considerably. A later process employs impregnated cotton fiber in the form of a batting which is compressed into thin sheets. Disks die-cut from the sheets are stacked between steel end plates and bolted or riveted together under pressure. Air and moisture are removed by a subsequent operation which is followed by an oil impregnation.

Non-metallic gears are usually assumed to have a fiber stress of 6,000 lb. per sq.in. as compared with 8,000 lb. per sq.in. for cast iron. Their greater resiliency adds to their safety. They must be lubricated as frequently as metallic gears. Pastes made of graphite and shellac or vaseline are satisfactory lubricants.—F. E. Gooding, in *Industrial Engineer*, Dec., 1926, p. 549.

How Should Squirrel-Cage Motors Be Started?

Line disturbances, when starting ignition motors, are caused not so much by the amount of current drawn from the line as by the suddenness with which the current is taken. To improve objectionable line condition caused by starting squirrel-cage motors, a time element should be specified to regulate the starting. Any change in the power demand will produce a voltage change, since it takes time for the system to become adjusted to the new condition. Therefore, any change in the power demand will set up a greater disturbance if the demand is made suddenly than if the current increases slowly.

Primary-resistance starting differs distinctly from the compensator method. In the first method, the voltage of the motor terminals varies with the current, whereas with the latter a constant voltage is impressed on the motor. With large capacity power stations, the load due to starting of large size squirrel-cage motors, as far as the generating station is concerned, is not great. However, disturbances on feeder lines, due to sudden drawing of large currents, is still a serious matter. Every power system has a time constant in which the power demand can be changed with a minimum of disturbance. The gradual-type primary-resistance starter offers the possibility of drawing current from the line with least disturbance.—G. O. Wilms, in *Power*, Dec. 21, 1926, p. 938.

Centrifugal Pipe Casting in Green Sand Molds

Centrifugal castings are not new in this country. To DeLavaud, a Brazilian, and his successors, belongs the credit for successfully casting iron pipe in revolving water-cooled molds. The latest development is by W. D. Moore, president of the American Cast Iron Pipe Co., Birmingham, Ala., which casts iron pipe centrifugally in green sand molds.

There are twelve casting machines, divided into two batteries that mold 4, 6, 8, 10 and 12 in. pipe. The sand mold is rammed in a flask and clamped firmly in the machine. Then the proper amount of metal is run into the ladle, the mold is started at a speed just sufficient to prevent the entering metal from scouring the surface of the mold. This also has the effect of skin-drying the mold uniformly.

The molds are spun by a 15-hp. variable speed motor, speeds varying from 400 to 1,500 r.p.m. The mold is started slowly and is again reduced as the metal solidifies.—Dan M. Avey, in *Iron Trade Review*, Dec. 23, 1926, p. 1609.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Beginning Volume 66

WITH this issue, the first in its fiftieth year of existence, the "American Machinist" commences its sixty-sixth volume. During this period, which measures the greatest industrial development in history, the editors and publishers of the magazine have striven to make it a chronicle of the best practice in the metal working industry and a friendly and constructive critic as well.

The new volume will be edited by K. H. Condit and F. H. Colvin, editors; L. C. Morrow, managing editor; A. L. DeLeeuw, consulting editor; and S. A. Hand, Ellsworth Sheldon, W. E. Irish, F W. Curtis, G. S. Brady, F. J. Oliver, Jr., A. K. Burditt and H. V. Doyle, Jr.

Air Rules at Last

AFTER much delay, which may have been justified in view of the rapid developments in aviation, we now have national rules for the operation of airplanes in the United States. These rules are made public by the Department of Commerce and have the expressed approval of representatives of all branches of the aeronautical industry. They became effective Dec. 31, 1926.

These rules govern the inspection and licensing of both aircraft and aircraft pilots. They provide penalties for violations and should do much to eliminate the many accidents that come from the gipsy flier and his decrepit plane. For, although the gipsy flier and his cruises at county fairs have done much to stimulate interest in aviation, they have also been responsible for many fatalities. Their day has passed and air transport now becomes an industry that is to be regulated by rules agreed upon by all the interested parties.

The Industrial Casualty List

ARE industrial accidents really decreasing, or is the increased use of machinery keeping up the high percentage ratio of accidents? At the Industrial Accident Prevention Conference held in Washington during the summer it was pointed out that industrial accidents in the United States still exceed 2,500,000 per year.

It is appalling that during every working day throughout the year 77 workers are killed and 8,331 more are injured in industrial accidents. This toll equals the casualties of a great war.

It is true that the employer suffers no physical injury, and his legal responsibilities are readily settled by insurance premiums that are shifted to overhead expenses. But it is a fact that the modern progressive manufacturer is vitally interested in accident prevention from a social standpoint as well as from the point of view of personnel and monetary loss. There has been talk of over-emphasized safety campaigns, but such argument given as a general statement is out of place until every shop in every part of the country has succeeded in reducing this enormous casualty list by steadily decreasing its own percentage.

Positive Lubrication Needed

LUBRICATION is one of the most discussed problems in connection with machinery and its uses. Designers, builders and users are all vitally concerned. The days of the open oil hole are doomed. The small capacity oil cups scattered all over a machine, many in inaccessible places, will not be long tolerated on high-production machines, run by semi-skilled operators whose one problem is production.

Forced mechanical lubrication is not new. It has been used for years in boring mills, milling, drilling, and other machines. But it has made much slower progress than its importance warranted. With successful examples of forced lubrication in almost every type of machine, it is not easy to understand the continued use of the uncovered oil hole on any high-production machine.

The idea is working, however, and we now find positive and automatic oiling devices on agricultural machinery. Some of the newer windmills have roller bearings and flood lubrication systems that require attention only once a year. It would seem that no builder of production machinery could find an adequate excuse for not giving the question of lubrication his most careful attention.

Where Is the Fool Killer?

AIR hose joke puts man at death's door. So reads a newspaper heading, referring to the recent serious injury of a shop employee whose intestines were ruptured by compressed air from a hose in the hands of a fellow employee.

A correspondent tells us of a similar "joke" perpetrated several years ago. The victim died; the leader of the jokesters went to prison for twenty years, and his assistant was ordered by the court to pay the victim's family a fixed sum of money each month.

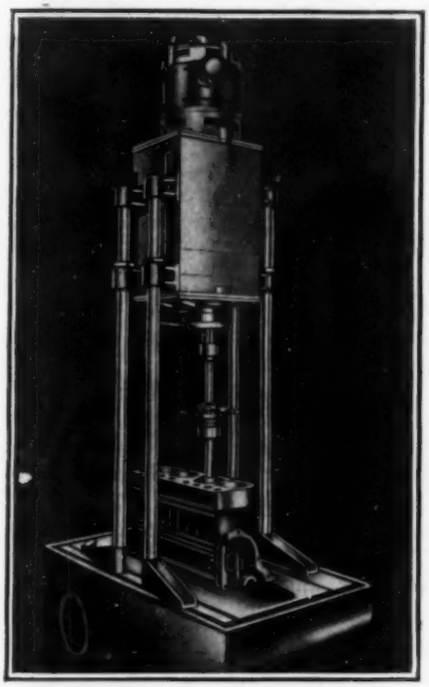
By some means or other every employee who has access to compressed air should be warned of its dangers and then penalized for using it in practical jokes. The penalty should fit the crime.

Shop Equipment News

Hutto Portable Cylinder Grinding Machine

THE Hutto Engineering Co., Detroit, Mich., has developed a portable cylinder grinding machine to meet the requirements of small production shops and service garages.

The unit combines a self-contained power plant and adjustable stroking mechanism with what is said to be a compact sturdy construction. The machine is light in weight and can be used for grinding a cylinder block in place in the chassis. By means of a universal range of adjustment of the swivel feet of this machine, it is possible to fasten it in place on top of the cylinder block, using the head stud bolts. The machine is equipped with ball bearings throughout.



Hutto Portable Cylinder Grinding Machine

The Hutto "Twin-Three" cylinder grinder is the tool used for the actual grinding. It consists of a hardened steel body, containing a full-floating, double-opposed cone assembly for the expansion and positive set of the six abrasive cutting units. With this construction, it is possible to correct out-of-round or taper conditions, "keyways," or bad scores in a worn cylinder. The walls are said to be made round and straight with a smooth satin finish, rather than a high polish.

This grinding tool may also be driven by a ½-in. heavy-duty electric drill, held and reciprocated by hand, or the same unit can be fitted to a brake-type production head and driven by a single- or multiple-spindle drill press equipped with a suitable reciprocating mechanism.

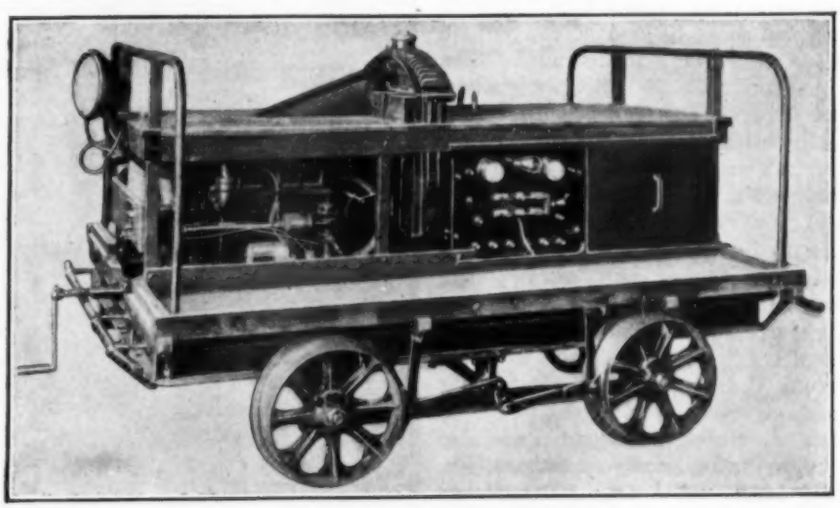
"Alternarc" Gas-Electric Welding Car

The Electric Arc Cutting and Welding Co., 152 Jelliff Ave., Newark, N. J., has brought out the gas-electric drive, self-propelled welding car shown in the accompanying illustration. The unit consists of a standard gas engine mounted in a standard truck car which is arranged for taking on and off the track by means of the frame sliding on the rails. The car has standard wheels and axles and is driven by means of a chain from a series-wound vehicle motor. One side of the car is insulated from the track.

The control equipment consists of an interlocking arrangement for even speed gradation ahead, reverse, and a neutral position for welding. Each position is interlocked so that when the engine is delivering power the car can be moved in only one direction, or when welding cannot be moved at all. A special lighting transformer is provided for illuminating the work at night. The car is also equipped with headlights and tail lights.

The gas engine is of the usual type, but has two outstanding features: The oiling system is so interlocked that the ignition magneto is cut off, should the oil be kept too low or the pump fail to work. Also in addition to a mechanical governor limited to various speeds by the interlocking mechanism, the motor is arranged with a throttle governor for welding so that the engine idles until the electrode actually touches the work. As soon as the arc is broken the engine idles again. With this arrangement, the life of the motor and apparatus is prolonged.

The welding generator provides both alternating and direct current for arc welding. A series-differential field is used for 20-volt metallic arc welding and a series-compound field for 40-volt carbon arc welding. In addition, the generator furnishes 110- or 220-volt power for lights, drills, grinders, etc. The armature shaft is mounted upon ball bearings. The equipment also includes an automatic reactor spring adjusted for all arc welding.



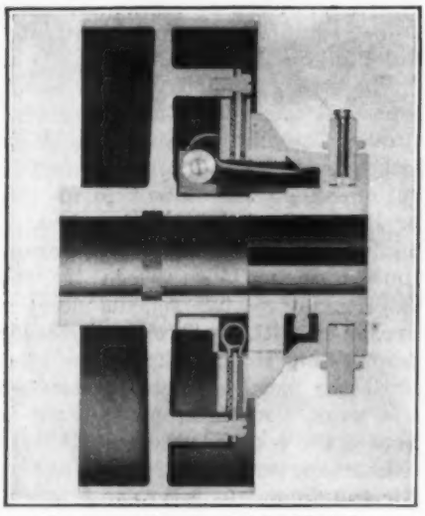
"Alternarc" Gas-Electric Welding Car

Shop Equipment News

Conway Disk Clutches

The Conway Clutch Co., 1956 West 6th St., Cincinnati, Ohio, is making a line of disk clutches in both single and multiple types and in three sizes. The hubs will accommodate shafts varying from 1 to 2½ in. in diameter in sixteenths.

In the single-disk type, shown in the illustration, the disks are made



Conway Single Disk Clutch

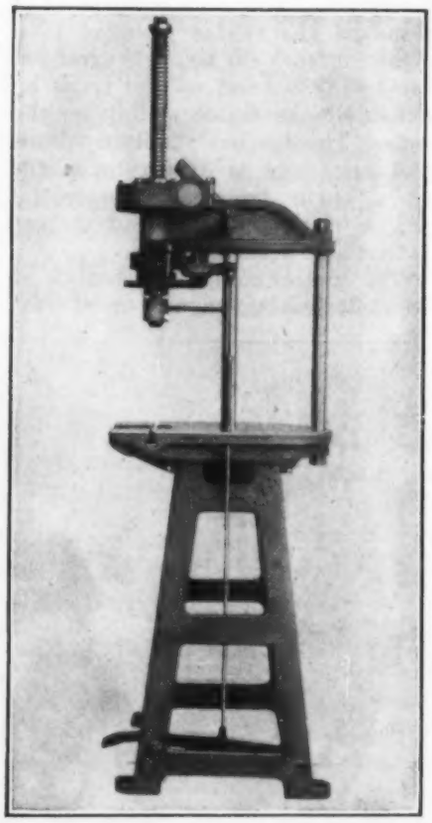
of heat-treated steel and are lined with metallic woven asbestos. The faces of the asbestos lining are ground to prevent dragging against the disks. The multiple-disk type operates in oil, but the single-disk type runs dry.

The clutch exterior is a cylindrical contour and no flying bolts, toggles, levers, or pins are exposed. The actuating members are completely inclosed and their engagement has been designed so as to provide convenient means for making adjustments. The adjusting ring is split and when clamped on the thread becomes practically integral with the clutch carrier. The three actuating levers employed are made of chrome-nickel steel, heat-treated, and are designed with a liberal factor of safety. In their underslung position, a large lever ratio is provided so that only a slight pressure is required to engage the drive. When the cone is withdrawn, the centrifugal force acting on these levers is sufficient to disengage the clutch, but springs are also provided to make the action positive. The deflection angle on the cone member is such that vibration cannot cause the clutch to disengage until the shifting lever is withdrawn. The keys are heat-treated to a degree of hardness to minimize wear.

This clutch is said to embody features of safety, simplicity, and balance, as well as considerable power capacity in its limited space.

General Manufacturing Co. 3-Ton Press and Straightening Machine

The 3-ton flexible power press and straightening machine shown in the accompanying illustration is being made by the General Manufacturing Co., Detroit, Mich. The machine is similar to the 8- and 20-ton 3-post machines made by this company. The pressure is applied through a screw jack, the nut of which is allowed to revolve free until a friction brake band, similar to the service brake of an automobile, is brought against it. With this construction the power applied on the ram is in direct proportion to the pressure applied on the brake by means of a foot pedal. The ram can be stopped at any point of its travel, and it returns to its up or normal position as soon as the foot pedal is released. This action is said to be particularly useful for straightening and assembling operations.



General Manufacturing Co. 3-Ton Press and Straightening Machine

The stroke of the ram is normally 8 in. maximum, but machines can be furnished with 9- and 12-in. strokes and with any special opening required. The normal distance from the table to the end of the ram is 12 in., while the distance from the center of the ram to the front of the post is 6⅞ in. and 5 in. to the front of the table, which is 15 in. wide. The table height is 40 in. from the floor, and it is provided with a ⅝-in. T-slot. These dimensions have been standardized in keeping with the requirements of the majority of users.

Straightening fixtures can be furnished with the machine, so that work can be straightened and tested on centers as many times as necessary without removing the part from the fixture until the operation is completed. The head of the machine is a complete unit and can be used to advantage on many special fixtures.

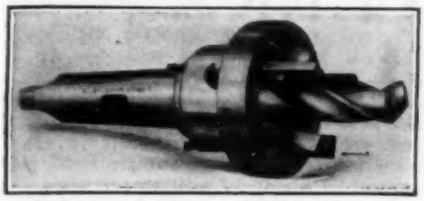
The machine can be supplied with either belt or motor drive. In the latter case a 2-hp., 1,200-r.p.m. motor is recommended. The floor space occupied by the machine is 24x24 in., while its overall heights is 90 in. The weight of the belt-driven model is 700 pounds.

Brubaker Trepanning Tool

The special trepanning tool illustrated has been designed by W. L. Brubaker & Bros. Co., 50 Church St., New York, N. Y., for cutting holes 3 in. in diameter and larger in flue sheets. It combines a standard drill, with a Morse taper shank, with special tools for trepanning and chamfering. The tool is made in positive sizes with no radial adjustments. Both the trepanning and chamfering cutters may be adjusted longitudinally, however, to maintain the proper lengths after grinding. The range of adjustment permits the maximum use of the cutters, all of which are made from high-speed steel to assure long life.

Advantages claimed for this tool are: shorter production time and hence lower cost of production due

Shop Equipment News



Brubaker Trepanning Tool

to the performing of several operations in one set-up, and accurate cutting of holes due to the rigid support of the cutters. The tools may be quickly taken apart or assembled.

"United States" Selective-Speed Buffers and Polishers

The United States Electrical Tool Co., Cincinnati, Ohio, announces a line of selective-speed buffing and polishing machines, incorporating motor-in-base drive. Speeds of 2,750 or 2,250 r.p.m. can be obtained at the spindle depending on the pulley sizes.

The two spindles are separate and are driven by belts from pulleys at either end of the motor. At the front of the machine, levers are provided for shifting the belt from the tight to loose pulley on the spindle. The illustration shows the method of drive. The belt tension is constantly maintained by the idler rollers.

Each machine is equipped with fourteen SKF marked ball bearings. The spindles are made of chrome-nickel steel. Automatic push-button control is provided with the control instruments mounted within the base. The machine is built in five sizes with 3-, 5-, 7½-, 10-, and 15-hp. motors, respectively.

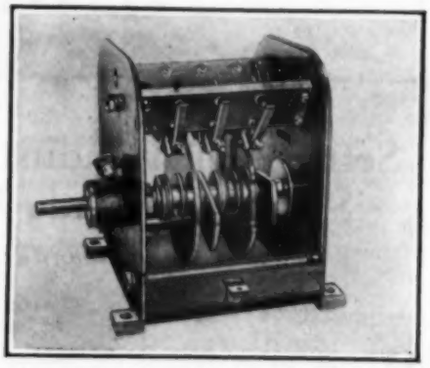
Addison-Leslie "Plastic Wood"

The Addison-Leslie Co., Canton, Mass., has developed a moldable pulp that handles like putty and hardens into wood. It is put up in one-quarter and one-pound cans. As it comes from the can, plastic wood, as it is called, can be molded with the fingers or pushed into holes and cracks. It will adhere to metal, tile, cloth, and glass, as well as to wooden surfaces. In its hardened form, plastic wood can be carved, planed, sand papered, and turned on the lathe. It will take paint and varnish exactly the same as any other wood. It differs from wood only in that it has no grain. Nails will not split it.

Plastic wood can be used for making repairs on machinery, for pattern work and for all kinds of mending.

E. C. & M. Rotating-Cam Limit Switch

The Electric Controller & Manufacturing Co., 2,700 East 79th St., Cleveland, Ohio, has developed a rotating-cam limit switch for use with magnetic controllers for the automatic control of machines having such fixed sequence of operation as slowing down, stopping, and reversing. In the illustration one of these switches is shown with the cover removed to indicate its construction.

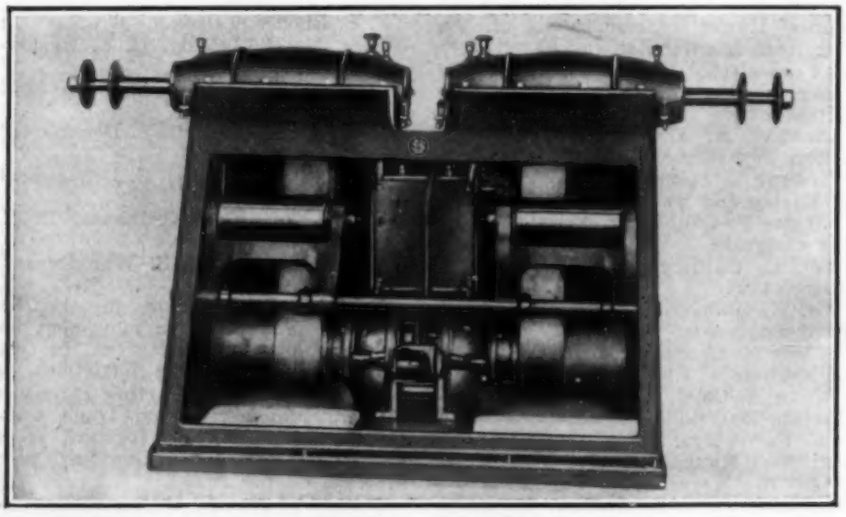


E.C.&M. Rotating-Cam Limit Switch

This cam-type limit switch is totally inclosed. The cam shaft is equipped with tapered roller bearings, and it is designed to carry up to six sets of contacts. The cams, which operate the opening and closing of the contacts, are each independently adjustable and can be fixed in any number of positions so that the unit is extremely flexible.

"Imperial" Oxy-Acetylene Welding Equipment

The Imperial Brass Manufacturing Co., Chicago, Ill., announces a complete line of oxy-acetylene welding and cutting torches and outfits. The standard welding torch is called Type X and is suitable for all ranges of oxy-acetylene welding. It embodies an improved mixing principle which, it is claimed, insures accurate control of the gases and thus assures successful welds.



"United States" Selective-Speed Buffer and Polisher

Trade Catalogs

Acetylene Generators, Airco Davis-Bournonville. The Air Reduction Sales Co., 342 Madison Ave., New York, N. Y., has published Catalog Section No. 5 on the above subject. Four sizes of carbide-type generators are described and illustrated by means of photographs. The catalog has eight 6x9-in. pages.

Dilatometer for Volcrit Heat-Treatment. The Stanley P. Rockwell Co., 66 Trumbull St., Hartford, Conn., has issued bulletin No. 2612 in which some of the outstanding features of the construction of the Rockwell Dilatometer are explained. The leaflet is illustrated.

NEWS OF THE WEEK

Settlement of Industrial Strife Furnishes Signal for Trade Revival in Britain

Machinery builders watching trend

BY OUR LONDON CORRESPONDENT

WITH the cessation of the mining dispute, Great Britain is settling down to work once more. Coal is being mined in fair and increasing quantities, almost a million men being engaged directly or indirectly. But, for various reasons, domestic coal is not always available as required and in view of contracts much is still being brought in from overseas. The price is coming down, but further reductions will be necessary before industrialists are satisfied, and the handicap to the metal industries presented by high fuel costs is certain.

One of the most hopeful areas is Sheffield where the depression has been most severe. Here, in connection with the steel industry, orders have been accumulating for about half a year and stocks have reached vanishing point. Nevertheless for new business it is reported that producers are in no hurry to quote until more stable costs can be estimated, and as prices must necessarily be high at present, customers are holding off. The chairman of one of the leading companies has asserted that "the immediate prospect in the iron and steel trade is brighter than at any time during the last four years."

One of the most hopeful features is the revival in shipbuilding, orders placed in two months amounting to about half a million tons. This does not in itself indicate anything like a boom, for production capacity is well in excess of such figures. Standing charges are high and the orders received may not mean much in the way of profits. It may be some time before work in the yards can really begin, owing to the lack of suitable steel plates, etc. That a more hopeful view is being taken in the industry is shown by the talk of a possible shortage of skilled shipyard labor. As in engineering, there has been a decline in the entry of youths into this industry, and in addition the industry has suffered because of workmen emigrating, particularly to America, and these men are not expected to come back.

Some sections of the machine tool industry have been turning their eyes to the shipyards as a possible source of new orders, a source from which very few have emanated during the past few years. This would help builders of fairly big machines, whereas from the activity that has prevailed in the motor car industry it is the builders of the smaller machines that have benefited. The machine tool trade has not been without its bright spots, though nobody could describe them as numerous, and export trade has been good with some firms. Exports for machinery as a class are lower than last year, but the difference is likely to be small as compared with what might have been expected under the circumstances.

Like the heavier branches of engineering, the motor car industry continues to afford reading in the daily newspapers, that is as regards the financial position of several concerns. One not specially large firm of subcontractors to that industry lost £7,000 during the last six months in bad debts, the total in some 14 years amounting to £50,000. Several of the heavier engineering firms are reorganizing and the best that some can apparently hope to do for some little time is to earn interest on less than one-sixth of its capital of about 19 million pounds.

Figures relating to British output of motor vehicles have recently been compiled by the Society of Motor Manufacturers and Traders, Ltd. Data for 1926 are of course not yet available. The total output for 1925 is given as 153,000, of which 121,000 were cars and 32,000 commercial vehicles. The figures are somewhat lower than those suggested by the British Engineers' Association. Apparently, for 1907 the total was estimated at 12,000. Of the world's consumption of motor vehicles the proportion of the British Empire as a whole is put at 8.8 per cent.

That further efforts are being made in connection with exports is a known fact, and the recent visit to London of the Empire prime ministers was used to further that object. Those at the head of the automobile industry are urging that a stable industry cannot be built up solely on home markets, and it was recently announced that one of the leading firms had contracted to supply 10,000 cars and lorries for Australia alone. This firm, like some others, is busy, particularly on commercial vehicle production.

Engineering Committee Reports Progress in Industrial Standardization

Charles E. Skinner re-elected chairman for 1927

At the annual meeting of the American Engineering Standards Committee on Dec. 9, Charles E. Skinner, a representative of the American Institute of Electrical Engineers, was re-elected chairman for the year 1927. Charles Rufus Harte, representative of the American Electric Railway Association, was re-elected vice-chairman. The other members of the executive committee for the year 1927 are as follows:

Samuel R. Bishop, American Institute of Architects.

George C. Stone, American Institute of Mining and Metallurgical Engineers.

James F. Callbreath, American Mining Congress.

W. C. Cushing, American Railway Association.

H. H. Quimby, American Society of Civil Engineers.

Cloyd M. Chapman, American Society of Mechanical Engineers.

John A. Capp, American Society for Testing Materials.

C. F. W. Rys, Association of American Steel Manufacturers.

A. H. Moore, National Electrical Manufacturers Association.

S. G. Rhodes, Electric Light and Power Group.

A. R. Small, Fire Protection Group.

Wm. J. Serrill, Gas Group.

W. A. E. Doying, the Panama Canal.

Albert W. Whitney, Safety Group.

Coker F. Clarkson, Society of Automotive Engineers.

F. L. Rhodes, Telephone Group.

Thos. H. MacDonald, U. S. Department of Agriculture.

George K. Burgess, U. S. Department of Commerce.

Nathan C. Grover, U. S. Department of the Interior.

Ethelbert Stewart, U. S. Department of Labor.

Chief, Bureau of Ordnance, U. S. Navy Department.

R. G. Barrows, U. S. War Department.

Notable developments in the industrial standardization movement including important progress in the mechanical and mining industries, in industrial safety, its further extension through managerial and trade association activities, and forward steps in international co-operation, have been achieved during 1926.

Instead of leaving their standardization work as a more or less incidental function of the engineering and produc-

tion departments, industrial executives are more and more providing a definite organization for their standardization work. The systematic organization of company standardization work is leading to a much larger degree of co-operation between companies.

In April there were held in New York the most important group of international conferences on standardization ever assembled. Of these the two principal features were the meeting of the International Electrotechnical Commission with its group of technical committees, and the Third Conference of the National Standardizing Bodies, in connection with which there were international technical conferences on screw threads, ball bearings, gages, and preferred numbers. In each of these technical conferences real progress was made toward bringing about international uniformity in industrial practice in the different countries. Twenty countries from Europe, Asia and South America were officially represented.

Simplifications Approved

The fifth year of Secretary Hoover's division of simplified practice shows steady development. About 50 simplifications have been carried through.

The work of the sectional committee on tooth form of spur gears, which has been in progress for several years, has been completed and has been submitted for the formal approval of the A.E.S.C. as a tentative American standard. Several parts of the comprehensive work on bolt, nut and rivet proportions, are now nearly completed, and the same is true of several sections of the work on pipe flanges and fittings.

The work on mechanical standards now in the course of development under A.E.S.C. procedure is so extensive that plans are under way for the organization of a representative advisory committee to keep the various parts of the work properly co-ordinated.

First Machinery Exhibit in China

During the week of Oct. 10, the Chinese national holiday, more than one hundred thousand persons attended the engineering exhibit held by the Nanyang University of Shanghai. It was the first exhibit of its kind ever held in China, and was held in connection with the celebration of the thirtieth anniversary of this university. It consisted of exhibits of machinery of all kinds manufactured by factories all over the world. More than fifty firms were listed as exhibitors.

Industrial Oven Notes

For the man who is concerned with oven economies and operation, a new industrial publication has appeared. It is in the form of a house-organ and is published by the Young Brothers Co., of Detroit, manufacturer of ovens and similar equipment. The publication, issued monthly, contains interesting and valuable articles describing the use of various ovens and heating processes in many industries.

Hoover Asks Greater Recognition for Scientists

The sun and the earth will speak to man and man will understand; the meaning of the messages from the sun that man calls "static" will be deciphered. These predictions were made by Dr. Michael I. Pupin, retiring president of the American Association for the Advancement of Science, who delivered the opening address at the annual meeting held in Philadelphia last week.

After recounting the half century of progress in electrical communication that began with Bell's invention of the telephone, Dr. Pupin, inventor of the vacuum tube telephone repeater, said:

"The next twenty-five years will not merely see men speaking to men all over the world. The earth itself, and the sun, that great center of all our terrestrial energy, which means all our life, will be speaking to men by means of electrical communications, and men will understand the messages."

Optimism regarding the increased happiness and prosperity scientific discovery will shower on mankind, marked many of the addresses delivered at the meetings. Scientists divided their attention between general sessions and meetings of the fifteen sections and forty-three allied societies holding national conventions at the University of Pennsylvania and other places.

The Background of Science

"The day of genius in the garret has passed, if it ever existed," said Secretary Herbert Hoover at a joint session of the association and the honorary scientific society Sigma Xi.

Nowadays, he pointed out, "discovery must be builded upon a vast background of scientific knowledge, of liberal equipment. It is stifled where there is a lack of staff to do the routine, and valuable time must be devoted to minor preparations.

"The greatest discoveries of the future," he added, "will be the product of organized research, free from the calamity of such distraction. Yet the whole sum we have available to support pure science research is less than $10,000,000 a year, with probably less than 4,000 men engaged in it."

But in the application of science to industry we are spending probably $200,000,000, with perhaps 30,000 men engaged, Mr. Hoover explained. Yet fundamental research in pure science is the basis of its applications.

Declaring that men of pure science were the most precious assets of our country and that their diversion to teaching and applied science reduces the productivity which they could and should give to the nation, Mr. Hoover pleaded for greater support for all men and women engaged in the pursuit of pure science. He said that the larger rewards of applied science had robbed the country to a considerable extent of the men who were best gifted for exploring unexplored fields in medicine, mechanics, electricity, physics and in all other branches of science.

"There is no price that the world could not afford to pay these men who have the originality of mind to carry scientific thought in steps or in strides. They wish no price. They need but opportunity to live and to work."

In conclusion he said: "No greater challenge has been given to the people of America since the great war than that of our scientific men in the demand for greater facilities. It is an opportunity to again demonstrate in our government, our business and our private citizens the recognition of a responsibility to our people and nation greater than that involved in the production of goods or trading in the market."

November Exports of Machinery Increase

The value of United States exports of industrial machinery in November amounted to $14,796,000, an increase of 19 per cent over the corresponding month of 1925, according to the industrial machinery division of the Department of Commerce.

The November volume brings the total exports of industrial machinery for the eleven months of 1926 to $143,000,000, as compared with $134,891,000 for the corresponding period of 1925.

The pronounced activity which has been manifested by the mining, oil-well and pumping machinery group continued through November with a gain of 30 per cent over the exports of the corresponding month of 1925. The eleven months total for this group represents an expansion of 42 per cent over the same period of 1925.

Exports of construction and conveying machinery during the month registered an increase of almost one-third over the corresponding month of 1925, while shipments in this group for the eleven months of 1926 showed an expansion of 36 per cent. Exports of steam engines were just double those for November, 1925, but this gain was insufficient to prevent a slight decline over the longer period. Minor decreases were experienced in exports under the head of textile, sewing and shoe machinery, both for the month and for the eleven months period. Shipments of metal-working machinery were only slightly lower for the month, but showed a decline of 15 per cent for the eleven months.

Will Not Ask Higher Tungsten Duty

Withdrawal of the recent application for an increase in the duty on tungsten is expected. Domestic producers are said to fear that the opening of the question at this time might result in a reduction rather than an increase.

It is known that there is a strongly-held opinion on the part of some administrative officials in the government service that our limited reserves of tungsten should be preserved against another day when we might be cut off from foreign sources of supply. If the matter of changing the rate of duty should come up it is expected that such a point of view would be stressed.

Credit Corporation Will Aid Installment Sales

A reserve system, nation-wide in scope, for credit finance companies that is expected to safeguard and guide installment selling in all industries affected by the problem of deferred payment sales has been formed as a result of a survey of thirty-four industries during the last year by the Advisory Committee on Finance and Industrial Credits, it was announced last week.

The system, which is to be known as the American Rediscount Corporation, patterned after but having no connection with the Federal Reserve system, will guide the financing of machinery, automobiles and other articles sold on the instalment plan.

Operations began on Jan. 5, the corporation having been chartered under the laws of Maryland with authorized capitalization of $31,500,000. These operations will be conducted through the Credit Corporation of America, recently organized under the banking act of New York.

At the head of the system will be Lawrence H. Hendricks, controller of the Federal Reserve Bank of New York. Relations with depository banks will remain undisturbed, and will be strengthened.

The corporation will have as an advisory board twenty-five bankers in different centers of the country, with five members from New York City. The chairman of the advisory committee will be Morgan J. O'Brien, trustee of the Metropolitan Life Insurance Co.; Emigrant Savings Bank and American Trust Co. Offices have been temporarily established at 160 Broadway, New York.

The committee has found that instalment sales in many industries are advisable and necessary. It has also found evidence of abuse in the methods of deferred payment sales, which, if allowed to continue, will result in losses to the public, banks and credit finance companies, which eventually may undermine the present system of mass-production and quantity sales.

This system will rediscount paper for member credit finance companies that may qualify and comply with the rules and regulations set forth by this system.

Engineers See Passing Of Roundhouse

Power experts and railway economists who are watching the development and the increasing use of the oil-electric locomotive on American rails foresee a day in which this latest motive force in railroading may bring about the gradual elimination of the roundhouse.

David Louis Jones, instructor in the Diesel engine department of the United States Submarine School, who has made an exhaustive study of the possible effect of the use of the oil-electric locomotive on the rails of America, says of this type of locomotive, "It is ready for instant service; it makes possible the elimination of roundhouses, coaling plants, ash pits, turn tables and hostling services—all of which are required for steam locomotives."

The steam locomotive is available from eight to ten hours a day and spends more than half of its time in the roundhouse, having its boiler and flues cleaned out and other troubles attended to. The oil-electric locomotive is able to operate a full 24 hr. It does not need to spend time in getting up steam. Its engines can continue running without stop, day in and day out.

Figures made public recently by the Chicago & North Western Railway, which operates two oil-electrics in Chicago, show a daily average of repairs of 63 cents for each locomotive, as against $16.20 for a steam locomotive engaged in the same work.

These savings, together with an economy of from 60 to 75 per cent in fuel cost, impel economists and engineers to forsee the gradual, general use of the oil-electric, and with it the possible disappearance of the roundhouse.

Edward Caldwell Resigns Presidency of McGraw-Hill Book Company

Edward Caldwell has resigned from the presidency of the McGraw-Hill Book Co., Inc., of 370 Seventh Ave., New York City, and will retire from active business. Mr. Caldwell has been associated with McGraw-Hill interests for thirty-six years. He was one of the organizers of the McGraw-Hill Book Co., Inc., in 1909, and has been active in its management since its formation. Mr. Caldwell will remain on the boards of directors of the McGraw-Hill Book Co., Inc., and the McGraw-Hill Publishing Co., Inc.

Martin M. Foss, who was associated with Mr. Caldwell in the organization of the McGraw-Hill Book Co., Inc., has been chosen to succeed Mr. Caldwell as president.

Florida Air Mail Suspended

Temporary suspension of contract air mail service on the route between Atlanta, Ga., and Miami, Fla., was authorized by Postmaster General New, effective at the close of business on Dec. 31. Under agreement with the Florida Airways, Inc., the service will be suspended until the proposed trunk line route from New York to Atlanta is placed in operation and lights are set up on the Florida route so that a schedule of night operation may be placed in effect.

Service has been operated on the Florida route for the past nine months with consistent regularity, but owing to the lack of lights for night flying and the resulting necessity of daylight operation the enterprise has not proved attractive and profitable.

Although the Department has paid the contractor more than was received in postage receipts, the line has not been meeting operating expenses. Because it was operating at a loss both to the contractor and the Post Office Department, the department agreed to the suspension.

American Pulley Wins Four Awards

The American Pulley Co., of Philadelphia, manufacturer of pressed steel specialties for industrial use, was awarded four prizes by the Jury of Awards at the Sesqui-Centennial Exposition.

This company received the Grand Prize for its pressed steel reels, spools, beams and beam heads for wire and textile manufacturers; the Medal of Honor for the "American" steel belt pulleys and "American" steel shaft hangers; a Gold Medal for the new "American" pressed steel hand truck; and a Gold Medal for the pressed steel car wheels for hand and inspection cars on railroads.

What the Railroads Are Doing

The Southern Pacific Co. has announced a $2,500,000 equipment construction program covering locomotives and other rolling stock which will be built in its California shops. At the company's Sacramento shops it is planned to build eight of the powerful mountain type locomotives. The actual erection or assembly of the engines will begin soon. It is planned that the cost of these locomotives will be approximately $85,000 each. The balance of the appropriation will go into other rolling stock which will be constructed in both the Sacramento and Los Angeles shops.

The Baldwin Locomotive Works shipped 843 steam and electric locomotives in 1926 against 724 the year before. Of the total 645 were steam, 196 electric and two gasoline.

Control of the Denver & Salt Lake R.R. passed on Dec. 31 from a receivership to the reorganized company, the Denver & Salt Lake Ry. An announcement to that effect was made by W. R. Freeman, who will be president of the company.

A decision striking at the power of the Interstate Commerce Commission was handed down on Dec. 31 by the United States Court of Appeals, when it set aside and vacated an order by the commission placing a valuation of $49,000,000 on the Kansas City Southern R.R. for rate-making purposes and perpetually enjoined the commission from fixing any valuation on the railroad's property. The injunction granted will be appealed immediately to the Supreme Court, to join a series of other cases, all involving the same issue. Practically all of the commission's railroad valuations are expected to be brought into the contest before the finish. Under the law, the commission is required to find such valuations and then make rates which will allow the carriers to earn a reasonable return.

More new railroad tracks were laid in 1926 than in any year since 1916, according to statistics gathered by railroad bureaus. The most recent of these states that during last year the total of new railroad trackage constructed was 1,005 miles, or 361 miles more than the new construction in 1925. Texas led all of the states, with new lines totaling 242 miles, and Florida was second, with 233 miles, while Arizona came third, with 145 miles. In the majority of the new lines built the distances covered were large, instead of being short extensions, as has been the usual thing in recent years.

R. B. Pegram, vice-president of the Southern Railway System, with headquarters in Atlanta, announces that the Southern has placed an order with the Tennessee Coal, Iron and Railroad Co., of Birmingham, for 46,825 tons of new steel rails for delivery during the first six months of 1927.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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REVIEWS of 1926 and forecasts of 1927 filled the newspapers last week.

Almost all the bankers and business men interviewed expressed a restrained optimism. Henry Ford said that 1927 would be normal, but he qualified this prediction with the observation that the business and profits of 1926 had been abnormal. This terse statement probably reflects the views of the majority, and if their prophecies are worth anything, the new year ought to be fairly satisfactory.

But there are some who dissent from them, and one investment house publishes an advertisement which reads as follows:

"On account of the prevalent tendency to stress only favorable features of present business activity, we believe thoughtful consideration should be given to the counter-factors and that these factors dictate a keynote of caution for American business in the consideration of plans for the years, 1927 and 1928.

"(1) We believe that the rise in average price levels of investment bonds and stocks has outrun the basic causes . . . namely, America's unequal share of the world's gold supply and the temporarily lessened demand upon the New York market for European reconstruction financing. We believe the near future will mark a drain upon our gold reserves through net exports of gold and that foreign reconstruction demands on capital will soon be renewed, emanating especially from France and Italy.

"(2) We believe that intrinsic and serious overproduction exists in our country, hidden under the cloak of installment buying.

"(3) We believe that, generally speaking, the farming area of our country is faced with economic difficulties for which the immediate future holds no reasonable relief, and that no sound prosperity can be maintained for long without the participation of this basic industry of our national life.

"(4) We believe that the long period of our country's favorable trade balance, of net exports over net imports, is temporarily at an end and that the immediate future will witness a decline of exports and increase of imports.

"(5) We believe the political situation to be somewhat unsatisfactory due to signs of the waning popularity of the conservative business administration now in power at Washington."

While the advertisement referred to is quoted in an effort to present both sides of the question, it is in order to add that even the most clairvoyant authorities are often mistaken in their forecasts of the future and that dogmatic prophecy is always dangerous.

It must be admitted that bank clearings, car loadings and many other statistics indicate that the *crescendo* movement of American business has been interrupted, but the administration at Washington seems to have a veritable passion for prosperity and its power to compel circumstances is so great that it can postpone a depression.

The basic cause for the recession already noticeable is the predicament in which the farmers find themselves because agricultural products are relatively low. At present values this year's crops are worth $1,100,000,000 less than last year's, and the purchasing power of those who own the land or till it is correspondingly reduced. The area of agricultural depression seems to be widening, and an Associated Press despatch reporting the failure of two important trust companies at St. Joseph, Mo., includes the statement that there have been 56 bank failures in Missouri during 1926. A somewhat similar situation in Iowa has been previously adverted to in these letters, and while the bank failures in the South have not thus far been numerous, the low price of cotton is restricting the volume of business.

But all this would be changed in the twinkling of an eye if the Government came to the rescue by accepting one of the various farm relief measures that have been proposed. Of the probability and the economic propriety of such action everyone must judge for himself, but it is not too much to say that the immediate future of American business is largely dependent upon the course that Congress and the President decide to take.

In the circumstances an alert and sagacious opportunism seems to be wisest, and the markets indicate that a majority are trying to keep close to the shore until they can see what way the tide sets.

The foreign news has been important politically but unimportant in its economic aspects. It is assumed that the French franc has been stabilized at about 4 cents.

Great Britain seems to think that nationalism is being reborn in China and has intimated a willingness to help in bringing up the infant when it is delivered.

Our Department of State seems to be having its troubles in Nicaragua, Mexico and the Philippines, but the man in Wall Street is not much concerned about what is happening so far away and the only really dark clouds that are to be seen as the year ends are those that overhang the grain states of the West and the cotton states of the South.

If these clouds can be dissipated and the deluge that they threaten can be avoided all may yet be well and 1927 may be a happier New Year than many now expect.

WHAT'S DOING IN INDUSTRY

ON THE following three pages there is given a summary of opinions on business in the machinery and machine tool industry for 1926, and a forecast for 1927. Prominent executives of leading firms have contributed their views.

AN ANALYSIS of these reports shows that 1926 was a prosperous year for this industry. There were some dull periods, but these were usually of a local nature and only temporary. The automobile industry was the largest buyer of tools, but general industrial plants were also good customers. The railroads bought in their usual desultory manner, and their total purchases were not up to expectations.

THE YEAR just opening holds forth great promise. Some believe that it will not show an aggregate of buying to compare with 1926, but there are many who look for a steady swing upward in the sales curve. The large accumulation of inquiries leads to the conclusion that sales will run into a good volume.

GENERAL conditions indicate a restrained optimism on the part of big business. It is said that 1926 was abnormal, and that 1927 will be normal. Therefore, the assumption is that business this year will not be as large as it was last year.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

This market, at the close of 1926, showed a twelve-months business that was satisfactory to most dealers and agents in the territory. The volume probably did not exceed 1925, but it was in many cases more profitable. An accurate picture of conditions is given in the following interviews with three prominent men in the district:

Leonard S. Horner, president of the Niles-Bement-Pond Co., says: "Machine tool business, as represented by the varied products made by our companies for the year 1926, shows improvement over recent years, and it is believed that the first six months of 1927 should continue at about the same rate of activity.

"There is, I believe, a growing determination on the part of machine tool manufacturers to find economic, sound ways of proving to the great manufacturing companies using machine tools their responsibility to our industry to encourage improvement in design, reduction in types and kinds, and standardization of parts common to similar machine tools. The machine tool industry is basic; on it certainly depends to no little extent the great progress in manufacturing made by our country along the line of labor-saving machinery involving mass production and lower costs.

"Machine tool manufacturers can improve their industry, and directly benefit themselves, by elimination of waste, standardization, and above all by better acquaintance, confidence and friendship between the executives of competing companies."

J. R. Vandyck, president of the Vandyck-Churchill Co., and president of the Associated Machine Tool Dealers, says this: "Considering the New York machine tool market apart from other Eastern centers, the closing year has not been a particularly satisfactory one.

"The volume for eleven months ran about 10 per cent below the 1925 average with the high point in March, tapering off to a real depressed condition in August when the turning point was reached. An ascending demand from then on brought November sales practically up to the high point for the year.

"It is interesting to note the relation between the records of inquiries or quotations and sales. In October, 1925, inquiries for machine tools began to increase in marked numbers, culminating in December with the largest number of inquiries on record for several years. This was reflected on the sales side by very active purchasing up to March, 1926, when the downward slide started and that movement both in inquiries and sales continued until midsummer.

"So far as the outlook for 1927 is concerned, it is not bad. A careful survey of outstanding quotations shows a large accumulation of deferred purchasing, which apparently will be placed early in the year, indicating that possibly the start of the new year will be similar to 1926, in spite of the fact that judging by inquiries alone, New York dealers should look for rather a moderate demand in the early months.

"The machine tool trade in spite of its basic importance is dependent on an extremely limited number of buyers. A small handful of individuals either pessimistically or otherwise inclined can start or stop a buying movement on very short notice and this will undoubtedly continue as long as machine tool users generally buy for immediate needs and do not establish a chosen connection between inventory values and shop obsolescence."

R. D. Heflin, sales agent in the New York territory for the Gisholt Machine Co., of Madison, Wis., expresses warranted confidence in 1927. He says: "The volume of 1926 business, and its much wider distribution, compares very favorably with 1925, and from the steady flow of inquiries coming in to us now we look forward to 1927 with a great deal of confidence."

"In 1925," he continues, "we met considerable competition from slightly used machines still being disposed of by war contractors. Due to the absence of this type of merchandise during 1926, we believe that this competition has now spent itself.

"A large percentage of the equipment sold by us in this territory went toward the replacement of obsolete machines, rather than to occupy new floor space or to equip new plants. There was keen interest shown by buyers in getting larger production and better quality from the same floor space and man power, and this, I believe, is a good omen for the manufacturer of high-production machinery."

CANADA

The outlook for the machinery and machine tool industry in Canada this year is more cheerful than it was at the beginning of 1926. A general survey of industrial conditions in the Dominion shows that the year 1926 closed strong, with sufficient business on hand or in sight to carry on during the first quarter of the current year.

At present there is a better balanced condition throughout the Dominion than has prevailed for some years. Less unemployment, increased railway earnings, larger bank deposits, and marked activity in the mining, pulp and paper, automobile, farm implement and electrical industries all indicate an upward swing.

With regard to the prospects of a continuance of the present period of prosperity, tentative indications thus far are encouraging, in that there does not appear to be any cause for misapprehension that the physical volume of business will fall behind during 1927, at least, for the first six months. The restraining influence of hand-to-mouth buying is credited with having steered the cycle of activity which is being experienced and there is no likelihood of a change in this method of buying, as its usefulness has been proven from time to time in avoiding over-production and large inventories.

Charles J. Brittain, vice-president in charge of sales of the Canadian Fairbanks-Morse Co. Ltd., said: "We may say that our machinery business during 1926 shows quite a satisfactory increase over that of the past several years. We confidently expect that business during 1927 will show a substantial increase over 1926, as industry has and will, no doubt, continue to show considerable expansion, due to generally improved conditions."

B. H. Neill, sales manager of the Canada Machinery Corporation, Ltd., stated that as far as his company was concerned business during 1926 was much improved over the last two or three years. With respect to the outlook for this year, he said: "We are hopeful, in fact, we believe that business during 1927 will be better still."

H. G. Bertram, of the John Bertram & Sons Co. Ltd., of Dundas, Ontario, said: "While the orders received during 1926 were not sufficient to run our plant at 100 per cent capacity, the conditions were very much improved over those existing in 1925. With another good crop in the West and general prosperity we think the machine-tool business should take another step in 1927 toward pre-war activity."

NEW ENGLAND

Machinery builders in Connecticut look back on 1926 with gratification and anticipate that business conditions in 1927 will be favorable. The improvement ranges from 10 to 40 per cent better than in 1925.

William J. Grippin, chairman of the board of the Bilton Machine Tool Co., of Bridgeport, states that his company's business is reflected by an increase of slightly over 10 per cent in net sales. "We have also increased the number of employees and hours of operation to some extent," said Mr. Grippin. "Our principal increase has been in the sales of our Pro-ducto-matic machine tools which are especially adapted to labor saving and increase of production. We are anticipating substantial betterment in the sale of our products, judging from the present active inquiries and also the actual orders being received."

"Up to now our 1926 billing shows an increase of 21 per cent, and productive hours an increase of 31 per cent, compared with 1925," states Charles L. Warner, president of the Baird Machine Co., of Bridgeport. He adds: "The outlook for 1927 is good because we are contracted well into the latter part of next year, and surely additional contracts which are sure to come along in the meantime should enable us to steadily increase business over 1926."

E. P. Bullard Jr., president of Bullard Machine Tool Co., says: "Our business activities in 1926 exceeded any previous year's business which we have had. We believe that it was due to the fact that we are making a product which enters largely into the present day demand for quantity production equipment. We anticipate a continuation of this activity, as we believe that mass production methods will prevail throughout the coming year."

Elisha H. Cooper, president of Fafnir Bearing Co., of New Britain, said: "The business of this company showed satisfactory progress throughout the past year, notwithstanding a very considerable slackening during the last quarter. We believe that general conditions throughout the country are sound and that there is no reason to expect other than a normal and satisfactory business for the coming year."

Fuller F. Barnes, president of the Wallace Barnes Co., of Bristol says: "Our business during 1926 in volume is a little better than in 1925. Our hours have been the same for both years and we used a few more employees during 1926. While business at the present time has dropped to some degree, we look for a fair volume of business for 1927."

R. F. Runge, vice-president of SKF Industries, Inc., stated: "The sales of the Skayef Ball Bearing Co., of Hartford, for 1926 should show approximately 40 per cent greater than for the year 1925. Pro-

duction for 1926 shows an increase of approximately 32 per cent in total weight, as compared with 1925. The number of employees remains approximately the same for the two years, although there was an increase in hours operated of approximately 8 per cent. With regard to the outlook for the year 1927, it is our opinion that the business for that year should amount to approximately the same as for 1925, which will show, of course, on that basis, some reduction as compared with 1926."

DeWitt Page, president of the New Departure Manufacturing Co., of Bristol, Conn., a subsidiary of General Motors of which he is vice-president, reports 1926 was abnormally good.

Mr. Page says: "The year 1926, up to within the past four weeks, was abnormally good. Notwithstanding a slight seasonal let up at present, we look forward to good steady business in 1927, which will at least be equal to that of the year just passed.

"We are living in a period of progress. We want each month to be more productive than the previous month and intensify our effort to attain such a result.

"We people who live in New England sometimes confuse pessimism with conservatism, and optimism with hysteria. A slight seasonal holdup may create undue timidity, and a rush of orders lead to overconfidence. Normalcy is the one thing we most desire and we have every reason to believe that the coming season will be perfectly normal with respect to business.

"We have been asked by some of our largest customers in the Middle-West why we do not move our factory out into the automobile zone. Our answer is that we have to manufacture to the closest possible precision limits, and to do this we must have only the best and most experienced help—quality workmen who can best be secured here in the East."

PHILADELPHIA

Representatives of machinery, machine tool and allied industries in Philadelphia regard the year's activities as a whole somewhat in excess of what were their expectations twelve months ago, and view 1927 as having prospects for business activities in excess of what 1926 has been.

The belief is almost universal that the railroads will continue their large earnings during the coming year, and that the automotive industry is now on a firmer foundation than ever before, with prospects for added stabilization. The general industrial situation is looked upon as being such that the machinery trade will enjoy an active year.

"The automobile business has been satisfactory throughout the year 1926 and it is our belief that we may expect a good year in 1927," said Edward G. Budd, president of the Edward G. Budd Manufacturing Co. "The automobile companies are buying with discretion and are not manufacturing in excess of their requirements. They are refining their product and perfecting their sales organizations—all of which should make for a sound business in the coming year."

Maxwell Alpern, president of the American Engineering Co., had an optimistic view of the situation. "Our business for 1926 has just about met our expectations," he said. "The outlook for 1927 is rather better than 1926."

Expansion and development of the radio is looked for by A. Atwater Kent, president of the Atwater Kent Manufacturing Co.

"The radio industry enters the year 1927 on a firmer and more substantial basis than it has ever known before," Mr. Kent said. "Both from the viewpoint of the manufacturers who produce radio equipment and of the public that uses it, the new year seems certain to bring new high records in achievement and satisfaction.

"I believe the public recognizes that the day of superficial innovations in radio equipment has passed. Public interest is today centered in the practical and permanent features of radio installation and successful manufacturers have concentrated on the production of equipment to meet that need.

"Radio is now accepted with as much definiteness as the telephone, the automobile, or the motion picture. This explains the U. S. Census Bureau figures on manufactures which show an increase of 1,000 per cent in the production of multiple tube receiving sets between 1923 and 1925. We found it necessary to speed production up to over 5,300 sets a day to meet the 1926 demand.

"The utility value of radio, its practical and cultural value, is today recognized as even greater than its worth as an instrumentality for entertainment. The result is that 1927 finds the field for radio expansion and development immeasurably widened, the position of the industry strengthened, and the demand for efficient, simple, high-grade sets greater and more generally distributed than at any time in radio history."

BUFFALO

The machine tool business is quiet in Buffalo at the present time. The tendency on the part of buyers is to mark time until the middle of January. Some business has been placed for delivery immediately after January first.

Henry W. Wendt, president of the Buffalo Forge Co., stated in an interview that business in 1926 had been up to expectations. "Business in 1926," said Mr. Wendt, "in this organization has been greater than that of any other year in the history of the company, with one exception. I am including war years in this statement. We have every reason to believe and actually look for business in 1927 to be even better than that of 1926.

"The natural trend of industrial effort, it seems to me, should be in the direction of preparation to meet foreign competition. This is not a serious factor in American trade today, but some day it is likely to become a great factor if we do not prepare to meet it."

J. L. Osgood, head of the J. L. Osgood Tool Co., stated that 1926 was up to expectations. Mr. Osgood, however, had not expected too much of it. He said he believed it compared favorably with, or at least as well as, any of the last three or four years. While he believes that the machine tool trade is not by any means back to normal, it is undeniably better than shortly after the war, and it ought to show some improvement next year.

"I have watched closely economic conditions in Europe," said Mr. Osgood. "Conditions there are improving. They are rapidly reaching a point where they can afford to buy modern American machinery. Indeed, they must buy it if they are to compete in the markets of the world. This is bound to have a good effect on American business.

SOUTHERN DISTRICT

Interviews with leading machinery and tool distributors in the South indicate that while business for the year 1926 was up to expectations, there has been a slight decline in sales in the past two or three months. Dealers seem to agree that the 1927 outlook is good, and that a normal business is in prospect. The outlook seems especially good in the textile field, due to the fact that there is not only a large amount of new construction being done, but that several millions is to be invested in the construction of large textile plants during the coming year.

J. R. Walraven, president of the Walraven Co., of Atlanta, distributors of a general line of machine tools in the industrial field, stated that business for the year was up to expectations, and particularly good in the machine shop field. "We look for good business in the Southeast in 1927," he said.

In the textile field the Atlanta offices of the Saco-Lowell Shops, and the K. L. Jones Machinery Co., reported business the past year up to expectations, and sales good through the whole year with the exception of a dull period during the late summer and early fall. The outlook for 1927 is considered particularly good in this field because of the large amount of textile mill construction contemplated in this section.

In the automotive field the Alexander-Seewald Co. reported a normal business for the year, with garage equipment sales the early part of the year establishing a record, but business not so active the latter part of the year. The 1927 outlook in this field seems fairly good.

CLEVELAND

A good year for the machinery and machine tool business for 1927 is predicted by leaders in the Cleveland field. No buying spasms are looked for, but a steady trend of conservative buying is in prospect. Much depends upon the automotive lines; if they have a good year, the local market will benefit accordingly.

Opinions for the coming year by leaders in the Cleveland industry are as follows:

"The machine tool industry has enjoyed a good year," states Col. Frank A. Scott, president of the Warner & Swasey Co. "The volume has been large, and the demand has originated from practically every metal working industry in this country and many in foreign countries. The market has shown the influence of the new designs, both in machines and in tooling equipments, which have appeared so general since the war. A very considerable portion of the volume during 1926 was for machines to replace existing equipment which the improvements had rendered obsolete.

"The expansion programs throughout the country, generally speaking, were modest, and the new equipment, therefore, represents to an impressive degree an improvement in the productive capacity of American metal industries.

"The price trend during the year has been steadily upward, but prices have not yet reached a level which affords good profits for the industry; and in view of the volume of business during 1926 the profits of most of the machine tool manufacturers will be disappointing. Even the most efficient, on the basis of the ratio of earnings to the volume of business, will not compare favorably with the leaders in other metal working industries.

"There was some good business in certain lines from foreign buyers but generally, the European demand was a disappointment.

"The outlook for 1927 seems to hold little prospect for a volume as satisfactory as that in 1926. The condition of the cotton market, and the textile industry generally; the lessening volume of business in the building trades; the unsatisfactory conditions in many Northern agricultural sections, and the possibilities of a bituminous coal strike all serve as warnings to the optimist. On the other hand, the railways have a fine program of equipment buying already under way; the European situation is likely to improve, and with that improvement may also appear a stiffening in the general foreign demand, and the automotive industry still contains the genesis of a good buying movement. The general prospect now is that it will be a good year, but there is little likelihood that it will develop into a peak year."

Fred H. Chapin, president of the National Acme Co., believes that in spite of the slump during November and December, the machine tool industry has good prospects. "I look for business to open next year at substantially the same rate which has prevailed this year," he said. "The interest shown in new models and products related to the automobile trades leads me to believe that the automobile industry, the largest individual buyer of machine tools, is going to have a big year, which will naturally reflect back on the machine tool business."

H. M. Rich, Sr., treasurer of the Cleveland Automatic Machine Co., says: "1926 was our best year since the war. Our sales increased 50 per cent over 1925. The outlook for 1927 is very encouraging. Although we hardly expect to equal last

year's sales, I believe that we will come within 25 per cent of it. I expect to see a general resumption of buying about February."

E. R. Motch, secretary of the Motch & Merryweather Co,. looks for a good year in the industry in 1927. "The old year was a profit-making one, and I think the new year will be a repetition of the old," he declared.

CINCINNATI

Taking 1926 as a whole, Cincinnati machine tool manufacturers regard it as a satisfactory year. While the sales of the first quarter were not as large as had been hoped, and while a very great portion of the year's business consisted of orders for single tools and replacements, the aggregate volume of the year is pronounced gratifying. Business was well scattered over the country and sales were well diversified.

The president of a prominent Cincinnati machine tool company declared that the year 1926 was a prosperous one for his firm and that it was fully up to his expectations. "We look for an increased business in 1927," he said. "While the average order may not be large, selling agents and salesmen will work harder to get single orders, and a larger aggregate of sales will be the result."

Another executive said: "The year 1926 has been fully up to our expectations. While I would not care to predict as to 1927, I can see no reason why it should not be as good as 1926, or even better. There are no unfavorable conditions in sight at this time."

An important dealer stated: "Our 1926 business was much better than we expected and our sales were much larger than we looked for at the beginning of the year. I am optimistic as to 1927 and expect a general market improvement. The steel situation seems to be a good sign, and I see no signs that are adverse."

The president of another company said that the past year was much beyond his expectations. It was the best year he had ever had, and last month was its best. "We expect a still greater demand next year," he added, "perhaps enough to require plant expansion."

DETROIT

With 1926 described as a good, substantial year for the machine tool and machinery industry in Detroit, leaders in the field are viewing 1927 with a firm belief that business will be quite uniform throughout the year.

While sales during the past twelve months did not total those of 1925, which was an abnormally good year, they were quite satisfactory in most instances.

Alfred P. Sloan, Jr., president of the General Motors Corporation, declares that "there is good reason to expect that 1927 will be another good year for the automobile industry; perhaps not as good as the past year, but a satisfactory year. It must be borne in mind," continues Mr. Sloan, "that 1926 has exceeded every previous year in the volume of automobile production and sales, that the domestic consumer demand has broken all records, and that export business has been the largest in history. It must be recognized that the volume of replacement automobile business is increasing rapidly, and that the overseas demand is steadily expanding, and that additional volume from these sources in 1927 will go far towards offsetting any reduction of new users buying in this country which may be experienced."

Charles T. Bush, head of Chas. A. Strelinger & Co., refers to 1926 as a "substantial year which compared very favorably with 1925."

The cost of doing business, however," said Mr. Bush, "has mounted during 1926, with a corresponding decrease in the margin of profit. The trend of purchasing has been toward general production cost-cutting equipment and the so-called standard lines have suffered. I look for this to be changed to some degree in 1927 and we should see standard machines more in demand because of the necessity of replacing obsolete and worn equipment."

George Turner, manager of the Detroit office of Strong, Carlisle & Hammond, takes a very similar attitude. He declares that 1926 was a much better year than had been expected, sales running higher than had been forecast largely because of the decision reached by a number of motor car manufacturers to revamp their lines and bring out new models.

"The 1926 sales," said Mr. Turner, "showed more than ever that the automobile business has become a highly specialized industry. As a consequence the special machines will be more in demand than ever during 1927. Where it is possible to apply a special appliance to a standard machine the buyer will purchase the Standard equipment, but not otherwise."

MILWAUKEE

The metal working equipment industry entered the new year with a uniformly optimistic view relative to prospects for new business. While December sales represented some recession from the earlier months of the year, the volume of business for the twelve months stands out as one of the best yearly totals in at least four years.

The fact that manufacturers of metal working equipment in this locality refrained from expansion, which at times was warranted by the demand and the pressure for deliveries, appears to be justified by current conditions, and the absence of excessive capacity is regarded as one of the most hopeful factors in the situation.

It is recognized that demand probably will not reach its best stride until after the middle of January, but inquiries that have been received in the last four to six weeks indicate possibilities of active business in the immediate foreground. Automobile demand, which became lax late in October, presents no alarming symptoms. Despite its relative importance, it has counterparts in railroad and industrial needs which provide a good balance for the tool trade at all times, and which give better promise now than they did a year ago.

Robert J. Wilson, president of the Kempsmith Manufacturing Co., Milwaukee, in speaking of current business and the outlook for 1927, said: "Our business in the year 1926 has been up to our expectations. Personally, I have considered it a normal year. If a firm has been unable to make money during the past year due to business conditions, I feel it will have equally as hard a time in 1927.

"We look forward to approximately the same general volume of business for 1927. Unless conditions in the agricultural sections grow worse, we feel that the automobile demand will be at least equal to that of 1926. The general industrial demand for machine tools should be about the same, while the railroad demand will unquestionably be somewhat greater."

CHICAGO

That the year 1926 was a prosperous one for manufacturers and dealers in this Mid-Western industrial center is attested to by the statements of two prominent men in the territory. Automotive buying has played a great part in this prosperity, but doubt is expressed as to its continuance this year. The first half of the year should be active but the second half is apt to be slow.

Speaking for the Marshall & Huschart Machinery Co., H. W. Jones, president of that company, expressed himself in the following words: "Our business for the year 1926 has been entirely satisfactory, comparing favorably with previous years. General industry has probably contributed more to the total volume of our sales than have the specialized industries. The automotive industry has been our leading customer. Having as yet made no analysis of this year's business, it is somewhat difficult to say just what proportion of sales railroad buying represents, but, hazarding an opinion, I should say that it comes third. It is early to make a forecast for next year with any degree of reliability, but, speaking from observation and experience, I am impressed with the belief that business will broaden out as the year advances, with the highest point in the upward curve being reached toward mid-year."

E. P. Essley, secretary of the E. L. Essley Machinery Co., spoke substantially as follows: "We are not disposed to believe that the year 1927 will, on the whole, prove as prosperous to those engaged in the machine tool industry as has the present year. This opinion, however, may be influenced by the fact that the business done by our company during 1926 has been of greater volume than that of any previous year since the World War. Railroads, manufacturers of automobiles and motor trucks, and makers of farm machinery, in this order, have contributed more to the total of our sales during 1926 than have any other industries. It is our belief that automobile production for 1927 will show considerable falling off. The buying power of the farmer has been materially curtailed, with the result that general industry throughout the country has suffered correspondingly. For these reasons, and the additional one, that the country will be disturbed by a presidential campaign in the near future, we are forced to believe that the machine tool business will probably not be as good next year as it has been this year, and that it may fall back to the level of 1925. This, of course, is only one opinion, and it naturally will be gratifying to everyone interested should it prove to be ill-founded."

INDIANAPOLIS

Machinery and machine tool business done by Indianapolis companies during the past year has not been all that was expected. Most of them appear satisfied and say the coming year should be good. Actual sales made in Indianapolis itself, and for city use, were disappointing, but the total volume of the companies was high. Estimates vary, but an average of 10 per cent increase might be arrived at when comparing 1926 with 1925 volume. Leaders in the trade are not looking for any boom next year. They believe normal has been reached and that business will proceed on its orderly course.

E. B. Knickerbocker, of the Wayne Machinery Co., of Indianapolis, says trade during the year has been somewhat spotty. "Take for example," he explained, "June, July and August. There were three poor months for us. We did a nice business up to that period, but then volume slumped. We have done a good business since that time, but it is doubtful if the fall and winter months will show as big a volume as the late winter and early spring months of the year did. Prospects for the coming year appear to be normal."

H. C. Atkins, president of E. C. Atkins & Co., of Indianapolis, said: "Business is a little ahead of the year before. I look for a good season next year; no boom, you understand, but good solid business. I believe business has leveled off to an even keel and right now there appear to be no disturbing factors. The credit situation is better. We have a big volume of trade with lumber manufacturers."

O. B. Iles, president of the International Machine Tool Co., is an optimist. He confesses to it. "Our business for the year has been very good," he declared. "Judging from the outlook at the present time, the first six months of the coming year, at least, should be good. Our staff of estimators are busy assisting factory superintendents and others with their problems, and at the present time requests for this service are giving us more than we can handle. We specialize on heavy turret lathe business and the sales volume is all that we could reasonably ask."

Business Items

The Grace Machinery Co., of Worcester, Mass., has taken over the Worcester Machinery Co., manufacturer of machine tools.

The Atlantic Machinery Exchange has opened offices and storerooms at 212 Centre St., in New York.

Rummins & Murray, Inc., of 4829 Woodward Ave., Detroit, are now representing the Wetmore Reamer Co. in Michigan territory.

The S. A. Woods Machine Co., of Boston, has purchased the W. B. Mershon & Co., of Saginaw, Mich., manufacturer of sawing machinery.

The board of directors of the Hilo Varnish Corporation, of New York, has authorized an increase in the capital stock of the organization from $600,000 to one million dollars.

The Banks-Miller Supply Co., of Huntington, W. Va., has been appointed district representative for territory covering the vicinity of Huntington for the Foote Bros. Gear and Machine Co., of Chicago.

In the recommendation for tax refund made last week by Secretary Mellon, the following firms are included: The Niles Tool Works, $183,000; Continental Motors Co., $214,494; Harley Davidson Motor Co., $180,109; American Rolling Mill Co., $100,690; Southwark Foundry and Machine Co., $127,556; Union Steel Casting Co., $105,247; Universal Rolling Mills, $361,006; Ajax Manufacturing Co., $104,531; Ludlum Steel Co., $133,929; General American Tank Car Corporation, $424,099.

The board of directors of the General Electric Co., at its meeting in New York on Dec. 30, elected Theodore Beran of New York, H. L. Monroe of Chicago, and J. A. Cranston of San Francisco, as commercial vice-presidents, in charge of the commercial activities of the company in the New York, Central and Pacific Coast districts, respectively. E. W. Allen, manager of engineering, was elected vice-president in charge of engineering, with offices in Schenectady.

The corporate form of two subsidiaries of the Westinghouse Electric and Manufacturing Co. has been discontinued and they have been merged into the parent company as branch works. The companies so affected are the Westinghouse Electric Products Co., of Mansfield, Ohio, and the George Cutter Co., of South Bend, Ind. In the future they will be designated as the Mansfield Works and the Street Lighting Department, respectively, of the Westinghouse Electric and Manufacturing Co.

Four new directors of the Studebaker Corporation at South Bend, Ind., were elected Dec. 27 at a special meeting of the board at the factory. The election was held to fill four vacancies caused by resignations. The new members of the board are Edward N. Hurley, of Chicago, chairman of the Hurley Machine Co.; John F. Harris, New York, of Harris, Winthrop & Co.; W. G. Warden, Philadelphia, Pa., chairman of the Pittsburg Coal Co., and Elmer Stevens, Chicago, vice-president of Charles A. Stevens & Bros. Mr. Hurley is former head of the United States Shipping Board.

Obituaries

LOUIS LEWIS, pioneer electrical engineer, and builder of the first electric street railway in this country at Richmond, Va., died in Philadelphia on Dec. 28. He was 78 years old.

GEORGE SIMPSON, formerly chief engineer of the Poole Engineering and Machine Co., of Baltimore, Md., died on Dec. 18, age 79 years. At an early age he went to work for his uncle, the late Robert Poole, founder of Poole & Hunt now the Poole Engineering and Machine Co. In a few years he became the chief engineer which position he occupied until 1896 when he resigned to become supervising engineer for the Farrel Foundry and Machine Co., of Ansonia, Conn. After five years service in this capacity he resigned again to become associated with the Poole company as consulting engineer.

Personals

GEORGE ROSS has been appointed as assistant to his father, Walter L. Ross, president of the Nickel Plate Railroad.

ALVIN S. RICH, formerly of the Wagner Electric Corporation, is now connected with the New York branch of the Industrial Electric Motor and Tool Co., of New York.

L. A. QUINN has been appointed acting manager of the Birmingham office of the Niles Tool Works Co., division of the Niles-Bement-Pond Co. He takes the place of the late N. C. Walpole.

JAMES F. HODGSON, commercial attaché of the Department of Commerce at Prague, Czechoslovakia, has been transferred to the department's office at Cairo.

A. D. MCDONALD has been appointed president of the Southern Pacific Co. in Texas and Louisiana. Mr. McDonald will continue as vice-chairman of the company with headquarters in New York.

JENS HANSEN, Danish engineer, of Copenhagen, Denmark, is in the United States. He is visiting large foundries and machine shops to secure ideas on American production methods.

H. C. LEMIRE, of 407 S. 4th St., Minneapolis, Minn., has been appointed district sales agent in Minnesota, the Dakotas and northern Wisconsin for the Burke Electric Co., of Erie, Pa.

REAR ADMIRAL YATES STIRLING, JR., recently in charge of the Washington Navy Yard and assistant superintendent of the naval gun factory, has been appointed Chief of Staff to the Commander in Chief of the United States fleet.

J. R. THOMPSON, formerly acting works manager at the Trafford shops of the Westinghouse Electric and Manufacturing Co., has been appointed works manager of the plant. Mr. Thompson has been connected with Westinghouse since 1897.

J. P. OHSOL, vice-president of the Amtorg Trading Corporation, New York, accompanied by Col. Hugh L. Cooper, sailed last week for Moscow, Russia, to discuss with the Supreme Economic Council of that country a contract for construction of the proposed superpower project in the Dnieper River.

GEORGE W. KITTREDGE, chief engineer for the New York Central R.R. since 1891, retired on Dec. 31. Mr. Kittredge has been connected with the Central lines during an entire career. He retired under the road's rule of pensioning employees at the age of seventy years. Mr. Kittredge is succeeded by Francis C. Freeman, who has been chief engineer of the Boston & Albany R.R., a subsidiary of the New York Central.

Calendar of Local Meetings

National Association of Cost Accountants

Boston Chapter. Jan. 20. "Standard Costs," by Eric A. Camman.

Buffalo Chapter. Jan. 27. "Co-ordinating the Factory and General Accounts to Insure Prompt Monthly Closing," by John E. Horn.

Chicago Chapter. Jan. 20. "Fixing Material Standards as a Basis for Standard Costs," by W. L. Churchill.

Cleveland Chapter. Jan. 19. "Distribution Costs," by F. L. Sweetser.

Detroit Chapter. Jan. 27. "Standard Cost Accounting for Automobiles," by G. Charter Harrison.

Erie Chapter. Jan. 17. "Department Burden, Overhead and Selling and Administrative Cost," by C. H. Scovell.

Hawaii Chapter. Jan. 25. "Mercantile Accounting," by C. P. Benton.

Hartford Chaper. Jan. 18. "Debatable Subjects of Mutual Interest to Foremen, and Team Work between Foremen," by H. G. Crockett.

Kansas City Chapter. Jan. 17. "Where the Cost Accountant and Engineer Meet."

Los Angeles Chapter. Jan. 18. "Costs of Selling."

Milwaukee Chapter. Jan. 20. by F. H. Elwell.

Philadelphia Chapter. Jan. 21. "Building and Loan Association," by Edward P. Moxey.

Providence Chapter. Jan. 10. "Distribution Costs." by M. E. Abbot.

Rochester Chapter. Jan. 19. "The Business Outlook for 1927," by J. C. Howell.

St. Louis Chapter. Jan. 18. "Appraisals and Their Relation to Costs," by H. G. Baldwin.

San Francisco Chapter. Jan. 24. "Developments of Budgetary Control."

Scranton Chapter. Jan. 25. "Transportation and Tonnage Taxes," by P. A. Kennedy.

Springfield Chapter. Jan. 19. "Business Outlook for 1927," by Ray Vance.

Syracuse Chapter. Jan. 18. "Why Systems Fail," by Robert Anderson.

Twin Cities Chapter. Jan. 18. "How-We-Do-It in Department Stores," by W. A. Dillman.

Forthcoming Meetings

American Engineering Council. Annual meeting, Hotel Mayflower, Washington, D. C., Jan. 13 to 15. A. C. Oliphant, assistant secretary, 26 Jackson Place, Washington, D. C.

American Society for Steel Treating. Winter Sectional Meeting, Washington, D. C., Jan. 20 and 21, 1927. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Society of Automotive Engineers. Annual meeting, Detroit, Jan. 25 to Jan. 28. E. F. Lowe, chairman, meetings and sections department, 29 West 39th St., New York.

American Society of Mechanical Engineers. Regional meeting, Kansas City, Mo., April 4 to 6. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

National Metal Trades Association. Annual convention, Hotel Statler, Detroit, Mich., April 25 and 26. J. E. Nyhan, secretary, Peoples Gas Bldg., Chicago, Ill.

American Welding Society. Annual meeting, Engineering Societies Bldg., New York, April 27, 28 and 29. M. M. Kelly, secretary, 33 West 39th Street, New York.

American Society for Steel Treating. Spring sectional meeting, Milwaukee, Wis., May 19 and 20. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Semi-annual meeting, White Sulphur Springs, W. Va., May 23 to 26. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

National Foreign Trade Council. Fourteenth national foreign trade convention, Hotel Statler, Detroit, Mich., May 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

Society of Industrial Engineers. Annual meeting, Hotel Stevens, Chicago, May 25, 26 and 27. George C. Dent, secretary, 608 S. Dearborn St., Chicago, Ill.

American Foundrymen's Association. Annual convention, Edgewater Beach, Chicago, June 6 to 10. R. E. Kennedy, secretary, 909 W. California St., Urbana, Ill.

National Supply and Machinery Distributors' Association. Twenty-second annual convention with the **Southern Supply and Machinery Dealers' Association,** and the **American Supply and Machinery Manufacturers' Association,** on board the steamship *Norovic.* Boat leaves Detroit, Mich., June 13 and returns there June 17. George A. Fernley, secretary, 505 Arch St., Philadelphia.

The Weekly Price Guide

Rise and Fall of the Market

HEAVY production of steel in 1926, compared with the year preceding, has worked toward the prevention of marked advances in price. Prospects of improved demand during the current quarter will serve to keep the market firm at present levels. There is active buying of rails and track supplies with indications of better movement of automotive steel in the near future. Pig iron remains quiet; scrap shows no definite trend; the coke market appears uncertain, with declining tendencies in furnace grades. Shapes and bars hold very firmly to the $2 per 100 lb. level at Pittsburgh; plates show similar tenacity at $1.90 per 100 lb., f.o.b. mill.

(*All prices as of Dec. 31*)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$24.19
Northern Basic	20.89
Southern Ohio No. 2	21.39
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	20.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	23.76
Virginia No. 2	28.19
Basic	21.26
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	24.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.76
Basic	20.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00@5.25
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.30@2.40	3.50	3.25	3.89
No. 12	2.35@2.45	3.55	3.30	3.94
No. 14	2.40@2.50	3.60	3.35	3.99
No. 16	2.50@2.60	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.80@2.90	3.75	3.60	4.15
No. 22	2.95@3.05	3.90	3.75	4.30
No. 24	3.00@3.10	3.95	3.80	4.35
No. 26	3.10@3.20	4.05	3.90	4.45
No. 28	3.25@3.35	4.20	4.05	4.60
Galvanized				
No. 10	3.25	4.10	3.95	4.40
Nos. 12 to 14	3.35	4.20	4.05	4.50
No. 16	3.45	4.30	4.15	4.60
No. 18	3.60	4.45	4.30	4.75
No. 20	3.75	4.60	4.45	4.90
No. 22	3.80	4.65	4.50	4.95
No. 24	3.95	4.80	4.65	5.10
No. 26	4.20	5.05	4.90	5.35
No. 28	4.45	5.30	5.15	5.60

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness — B.W.G. and Decimal Fractions		Outside Diameter in Inches — ¼	⅜	½	⅝	1	1½	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	7.00	6.00@7.50	4.65†
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.90@3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ⅛, 7.85c.; 5/32 to ⅛, 7.35c. per lb. *Flat, 1/16@¼-in. thick. †F.o.b. cars.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.75
Tin, 5-ton lots, New York			68.50
Lead (up to carlots) E. St. Louis	7.65	New York	8.50
Zinc (up to carlots) E. St. Louis	7.05	New York	8.00

	New York	Cleveland	Chicago
Antimony (Chinese), ton spot	15.50	16.50	15.00
Copper sheets, base	22.25	22.00	22.25
Copper wire, base	19 12½	19.00	15.75
Copper bars, base	21 87½	21.62½	21 87½
Copper tubing, base	24 25	24.00	24.25
Brass sheets, high, base	18.62½	18.37½	20.12½
Brass tubing, high, base	23.50	23.25	23.00
Brass rods, high, base	16 37½	16.12½	16.37½
Brass wire, high, base	19 12½	18.87½	19.12½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	27.00	27.00	27.02
Zinc sheets (casks)	13.00	12.80	12.01
Solder (½ and ¼), (case lots)	41.00	44.50	38½@42½

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	86.00
Commercial genuine, intermediate grade	61.50
Anti-friction metal, general service	32.50
No. 4 babbitt (f.o.b.)	13.50

Nickel, f.o.b. refinery, cents per lb.:
Ingots 35.00 Electrolytic 39.00 Shot 36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.75 @12.00	11.00	10.50@11.00
Copper, heavy, and wire	11.00 @11.50	11.25	10.00@10.50
Copper, light, and bottoms	9.50 @10.00	9.50	8.75@ 9.25
Heavy lead	6.37½@ 6.87½	6.50	6.00@ 6.50
Tea lead	4.50 @ 5.00	4.50	4.75@ 5.25
Brass, heavy, yellow	7.00 @ 7.25	7.25	6.50@ 7.00
Brass, heavy, red	9.25 @ 9.75	9.25	8.50@ 9.00
Brass, light	5.50 @ 5.75	6.00	6.00@ 6.50
No. 1 yellow rod turnings	7.75 @ 8.00	7.50	7.25@ 7.75
Zinc	4.25 @ 4.50	4.00	3.50@ 4.00

TIN PLATES—American Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	6.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13@0.17½	$0.18	$0.15@0.20
Cotton waste, colored, per lb.	.10@ .14	.13½	.12@.17
Wiping cloths, washed white, per lb	.17½	36.00 per M	.15
Sal soda, per 175 lb. keg	2.80	2.75	2.75
Roll sulphur, per lb.	.04	.03½	.04
Linseed oil, per 7½-lb. gal., 5 bbl. lots	.81	.98	84
Lard cutting oil, 25% lard, per gal.	.55	.50	.48
Machine lubricant, medium-bodied (55 gal. metal bbl.), per gal.	.35	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.1637½	.1662½	.1687½
Solder (½ and ½)	per lb.	41	.43	.4025
Cotton waste	per lb.	.13@17½	.13@.17½	15@22
Washers, cast iron (⅛ in.)	per 100 lb.	7.00	7.00	7.00
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.35	.35	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in.	off list	40%	40%	40%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.40	$5.84	$5.13
Emery paper	10.71	11.00	10.71
Emery cloth	27.84	31.12	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.45	1.32
Cloth	3.10	3.50	3.05
Fire clay, per 100 lb. bag		.75	75
Coke, prompt furnace, per net ton	Connellsville,		3.25@3.50
Coke, prompt foundry, per net ton	Connellsville,		4.50@5.50
White lead, dry or in oil,	100 lb. kegs	New York,	15.25
Red lead, dry	100 lb. kegs	New York,	15.25
Red lead, in oil	100 lb. kegs	New York,	16.75

SHOP SUPPLIES

Machine bolts, ¾x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1¼ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%.

Carriage bolts, ¾x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{1}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x¾-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ¾x¾-in., 2c. each. Discount 70% for $\frac{5}{16}$-in and smaller and 65% for ⅜-in. and larger.
Case hardened ¾x¾-in., 6c. each, less 50%.

Rivets, button heads, ⅜-in., ½-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1¼ to 2-in. long, all diameters, 25c.; ⅝-in. dia., 35c.; ¾-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb. 50c.; countersunk heads, 45c.

Washers, cast iron, ⅛-in., $7.00* per 100 lb. at New York warehouses; ¼-in., $6.00* per 100 lb.

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Ind., Anderson—Ames Shovel Co., E. T. Nipher, Supt.—new machinery and equipment for 1 story, 80 x 200 ft. plant, under construction.

Ind., Anderson—Remy-Delco Corp.—complete foundry equipment.

Ind., Indianapolis — B. & F. Mfg. Co., 2007 Ludlow St.—new electric crane for proposed foundry.

Mass., Malden (Boston P. O.)—L. M. Fowler, 424 Pleasant St.—miscellaneous tools and equipment for proposed garage and repair shop. Estimated cost $40,000.

Mass., Roxbury (Boston P. O.)—J. Rudnick, 333 Washington St., Boston—miscellaneous tools and equipment for proposed 85 x 190 ft. repair and service garage on Clifford St., here. Estimated cost $75,000.

Mich., Detroit — D. D. Wessels & Sons Co., 1625 East Euclid Ave. (laundry tubs) 50 ton blow type punch press.

N. Y., Owego—J. Alden Loring—prices or catalogs from tool-makers and die-makers.

N. Y., Rochester—Rochester Gas & Electric Corp., 89 East Ave., one 2 ton crane for proposed 60 x 120 ft. pole casting plant.

Tex., San Antonio — General Welding Co., 105 Villita St.—machinery and equipment for proposed 1 story, 50 x 75 ft. welding plant. Estimated cost $30,000.

Ont., Alexandria—C. McKinnow, Elgin St. — complete equipment for blacksmith and wheelwright shops.

Ont., Collingwood — Collingwood Shipyards Ltd. interested in prices of engines and equipment for the construction of large lake boats.

Que., Montreal—Corporation of Montreal, will receive bids until Jan. 8 for one screw machine.

N. Z., Wellington—New Zealand Government Railways will receive bids until Apr. 18 for electric overhead travelling cranes, 4-100 ton, 78 ft. 6 in. span, 2-25 ton 80 ft. span, 16-10 ton 47 ft. span, 3-10 ton 67 ft. 6 in. span, 4-10 ton 75 ft. span, 6-7½ ton 47 ft. span, 1-7½ ton 80 ft. span, 9-5 ton 47 ft. span, 1-5 ton 50 ft. span, 2-5 ton 78 ft. 8 in. span, 4-2 ton, 39 ft. 3 in. span, 3-2 ton 47 ft. span; 3 electric traversers, 120 jib cranes, 20 electric capstans, 4 electric mobile cranes, etc.

Opportunities for Future Business

Arkansas—Dierks Lumber & Coal Co., 700 Gates Building, Kansas City, Mo., is having plans prepared for the construction of a lumber mill including machine shop, etc. near Hot Springs. Estimated cost $1,000,000.

Calif., Los Angeles — Chapman Bros., 3469 West 6th St., awarded contract for the construction of a 5 story, 90 x 275 ft. garage at Sixth and Mariposa Ave. Estimated cost $250,000. Noted Dec. 30.

Calif., Los Angeles—J. Engert, c/o E. J. Borgmeyer, California Bldg., Archt., is having plans prepared for the construction of a 1 story, 105 x 295 ft. garage on West Vernon Ave.

Calif., Los Angeles—U. S. Electrical Mfg. Co., C. E. Johnson, V. Pres., 200 East Slauseon St., awarded contract for the construction of a new factory to be used as a non-ferrous foundry.

Calif., Los Angeles—Wurlitzer Co., 814 South Broadway, manufacturers of musical instruments, is having plans prepared for the construction of a 1 story, 100 x 250 ft. factory on East Fourth St. Estimated cost $80,000. Austin Co., 777 East Washington St., Archt.

Calif., San Francisco—B. Schlessinger, c/o T. Ronneberg, Crocker Bldg., Engr., is having plans prepared for the construction of a 2 story garage at Van Ness Ave. and Market St. Estimated cost $150,000.

Calif., San Francisco—U. S. Steel Products Co., Rialto Bldg., will build a shop on 20th St. Estimated cost $48,000.

Colo., Denver—Western Steel Corp., D. Lamon, recently incorporated, will build a plant to use the Lamon patent for steel hardening.

Ill., Chicago—J. O. Stoll, 245 East Grand Ave., will soon award contract for the construction of a 5 story, 100 x 150 ft. garage at 1017 North Clark St. Estimated cost $250,000. Fox & Fox, 38 South Dearborn St., Archts.

Ill., Peoria—Peoria Auto-Body Repair Co., Fifth and Franklin Sts., awarded contract for the construction of a 2 story, 60 x 150 ft. auto body repair plant at Second and Munson Sts. Estimated cost $50,000.

Ind., Indianapolis—S. Cohen & Son is receiving bids for the construction of a 2 story, 100 x 136 ft. machine shop and service building at 140 West Vermont St. Estimated cost $45,000. B. Kay, 738 Lemcke St., Archt.

Ind., Indianapolis—Thornburg-Lewis Co., 1300 East Washington St., is having plans prepared for the construction of a 2 story, 90 x 188 ft. machine shop and service building. Estimated cost $50,000. Doeppers & Lennox, 226 East Michigan St., Archts.

Ind., Lafayette—Chicago, Indianapolis & Louisville R.R., 608 South Dearborn St., Chicago, approved plans for the construction of new railway shops here. Estimated cost $350,000. A. S. Kent, Ch. Engr.

Ia., Mason City—Olaf Ulen Radiator Repair Shop, 3258 Delaware Ave., will build a 2 story, 88 x 90 ft. machine shop and garage. Estimated cost $50,000. Private plans.

Mass., Arlington (Boston P. O.)—Blomquist & Howes, 100 Charles River Rd., Cambridge, plans the construction of a 1 story repair and service garage. Estimated cost $50,000. Architect not selected.

Mass., Boston — Commercial Building Corp., R. A. Nordbloom, 79 Milk St., awarded contract for the construction of a 4 story garage and sales and service station at Commonwealth Ave. and Gardner St. Estimated cost $400,000. Noted Oct. 21.

Mass., Boston—Transportation Building Corp., 30 Federal St., awarded contract for the construction of sales and service building on Commonwealth Ave.

Mass., Cambridge (Boston P. O.)—R. H. O'Neil, 1384 Massachusetts Ave., plans the construction of a 1 story repair and service garage at 47 Austin St. Estimated cost $50,000. Architect not selected.

Mass., Everett (Boston P. O.)—Maltzam & Rovner, 22 Summer St., are receiving bids for the construction of a 1 story, 85 x 140 ft. garage and repair shop at Chelsea and Clinton Sts. Estimated cost $45,000. S. E. Moffie, 51 Cornhill, Boston, Archt.

Mass., Lynn—G. Mendelsohn, Grossman Bldg., is having plans prepared for the construction of a 1 story, 100 x 175 ft. garage and repair shop on Union St. Estimated cost $50,000. G. A. Cornet, 10 Central Ave., Archt.

Mass., Newton (Boston P. O.)—P. A. Murray & Co., 210 Washington St., is having revised plans prepared for the construction of a 2 story repair and service garage. Estimated cost $40,000. Private plans. Noted Dec. 16.

Mass., Roxbury (Boston P. O.)—G. F. Golub, 12 Garden St., Boston, awarded contract for the construction of a 1 story, 100 x 190 ft. repair and service garage at 812 Huntington Ave., here. Estimated cost $50,000.

Mass., Somerville (Boston P. O.)—M. Bornstein, 64 Charlesgate St. E., Boston, is having preliminary sketches made for the construction of a 1 story addition to repair and service garage. Estimated cost $50,000. Private plans.

Mass., Wellesley (Boston P. O.)—J. E. Lee, 562 Washington St., is having plans prepared for the construction of a 1 story repair and service garage at Linden and Central Sts. Estimated cost $75,000. O'Connell & Shaw, 134 Newbury St., Boston, Archts.

N. Y., Dansville — Power Specialty Co., 111 Broadway, New York, manufacturers of power plant equipment, plans the construction of addition to plant here. Estimated cost $150,000. Private plans.

N. Y., New York—Bd. of Transportation 49 Lafayette St., plans the construction of yards and shops at 207th St. Estimated cost $2,000,000. Private plans.

N. Y., New York—Finkmore Realty Corp., A. Finkelstein, c/o M. Deutsch, 35 Maiden Lane, Archt., is having plans prepared for the construction of a 6 story, 100 x 260 ft. garage at 211 West 61st St. Estimated cost $650,000.

O., Cleveland—Bryant Heater & Mfg. Co., E. P. Bailey, Jr. Pres., 17825 St. Clair Ave., (gas boiler heating systems) awarded contract for the construction of a 1 story, 75 x 280 ft. addition to factory. Estimated cost $150,000. Noted Dec. 16.

O., Cleveland—The Cleveland Gasket & Mfg. Co., H. A. Lindsley, Pres., 1610 West 116th St., had plans prepared for the construction of a 3 story factory at 1602 West 116th St. Estimated cost $75,000. G. F. Hammond, Zanesville, Archt.

O., Lakewood (Cleveland P. O.)—M. Margolin, 1489 East 106th St., Cleveland, awarded contract for the construction of a 3 story, 63 x 120 ft. garage at Waterbury and Madison Aves. Estimated cost $225,000.

Pa., Philadelphia — R. L. Binder Metal Coating Co., 10 South 18th St., awarded contract for the construction of a 5 story, 30 x 100 ft. factory at American and Buttonwood Sts. Noted Nov. 25.

Pa., Philadelphia—Central Plumbing & Supply Co., 12th St. and Spring Garden, plans the construction of a warehouse and sales and service station at Alleghany and 6th Sts. Architect not selected.

Pa., Scranton—F. Wesel Mfg. Co., Harry and Cranberry Sts., Brooklyn, N. Y., machinery manufacturers, awarded contract for the construction of a 1 story, 200 x 480 ft. factory on Siding St., here.

Pa., Williamsport—Bd. of Education, J. E. D. Huffman, Chn. of Building Committee, plans the construction of a 3 story, 80 x 100 ft. addition to Curtin Junior high school including shops, etc. Estimated cost $200,000. Richter & Eiler, Reading, Archts.

Tenn., Paris—Louisville & Nashville R.R. Co., Louisville, awarded contract for the construction of a 72 x 120 ft. planing mill. Estimated cost $75,000. Noted Dec. 23.

Ont., Blind River—The Shevlin Clarke Co. Ltd., plans the construction of a sawmill. Estimated cost $2,000,000.

Ont., London—Richards Wilcox Canadian Co., manufacturers of hardware specialties, awarded contract for the construction of addition to plant. Estimated cost $50,000. Noted Nov. 18.